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The Organization, Management, Duties, Training, etc., of the Sanitary Service With a Newly Raised Regiment.

By Major Elbert E. Persons, Medical Corps.

The development of armies in the face of an enemy has always been, and is today, the proclaimed and generally accepted military policy of our Government. Relying on the small Regular Army, reënforced by the National Guard, for its first line, supplementary troops are to be provided by organizing regiments of citizens and transforming these into soldiers by training and drill.

The first requisite to and measure of success in providing for our national defense under this policy is the unqualified recognition and acceptance by all concerned of the fact that a body of citizens may be organized along military lines and furnished with the necessary military equipment, but it remains—only a body of citizens. It can form no part of an army worthy of the name, until the individuals composing it have been trained and drilled; until the evolution of the soldier from the civilian has been accomplished. Every decade that passes renders the problem of the development of an army from a body of citizens more difficult. On the one hand, a higher and more extensive training is required and on the other hand, the time available in which to give this training has been shortened, inasmuch as the facilities for

transporting troops now render it possible for one nation to confront another—even though far removed—with an imposing army in a small fraction of the time formerly required.

The necessity for making intelligent use of all time and of every energy available for the training of newly enlisted men in time of war is therefore apparent. Whoever undertakes the task of supervising and directing the evolution of the soldier from the civilian when war is imminent or in progress is foreordained to failure, unless he has an almost appalling realization of the magnitude of his task and of the gravity of the responsibility which devolves upon him. This applies to all branches of the service and not less to the sanitary service than the line of the army.

In discussing today the development of an adequate sanitary service with a newly raised regiment, let us assume that a man has been selected as surgeon who brings to the work, in addition to satisfactory professional qualifications and personal habits

(1) a reasonably high conception of what his department—individually and collectively—should be:—that is, a reasonable ideal.

(2) Tact.

(3) An abundance of energy and enthusiasm.

A man with less qualifications in so important a position as regimental surgeon not only stands no chance of succeeding, but is an impediment to the regiment.

The surgeon of a regiment, having been chosen, is usually given some voice in the selection of his assistants, and wisely so. Personal compatability of the medical staff will greatly facilitate that team work which is essential to the best results. The enlisted personnel will be secured by enlistment of men for the Hospital Corps, or by the transfer of men, or

special qualifications, from line organizations. In time of war it is possible to enlist trained men who will not only be able to perform certain duties efficiently from the start, but will be of assistance in the training of other men. Cooks, pharmacists, men of clerical ability and men familiar with the handling of animals should be secured if practicable before filling the alloted quota with men of only general qualifications. In securing recruits for the detachment, the promising of grades or of assignments to individuals as inducements to enlist, is not a good policy. There should be no bargaining, before enlistment or after. The surgeon should be bound by no obligations to any one under him.

At the outset, the surgeon will be confronted with the necessity for selection of noncommissioned officers. Nothing which he can do subsequently can compensate for mistakes made here. He should make every effort possible to become thoroughly acquainted with his men under the conditions incident to camp life before he recommends any one for promotion.

Provision is made in Army Regulations for the appointment of men as lance corporals, and their assignment to duty as noncommissioned officers, thus giving them an opportunity to demonstrate their ability before they receive their warrants. To err in judgement in the choice of noncommissioned officers is most unfortunate, for the uselessness of a man is greatly impaired by promoting him and then reducing him.

The assignment to duty of the officers and enlisted men will vary so greatly from time to time, depending on the work to which the regiment is assigned, that their consideration will be taken up under *management* rather than under *organization.*

The management of the detachment, once it is formed, can be profitably discussed only in the most general terms. Regulations cover the points on which there must be uniformity. As for details, the personality of each individual surgeon should be reflected in his administration.

The men constitute the rough material out of which the surgeon must construct the machine through the operation of which he is to accomplish the work assigned him. No hard and fast rules can be laid down here. The mind that is to operate the machine must have a clear idea of the work that is required and then use his material to the best advantage. There are certain broad principles which underly successful administration which may be briefly mentioned. First, the attitude of the surgeon toward his men is a vital consideration. A subordinate dislikes to feel that he is liable to suffer because of the moods to which a commander may be subject. Evenness of temperament is a great asset in the management of men and should be assiduously cultivated. The life of an enlisted man is so completely in the hands of his commanding officer that each one of them has a right to expect that a lively interest will be shown in his individual welfare and comfort. Men are contented and satisfied under commanding officers who exert every effort possible to insure good quarters and good food for them, and who are alert to see that justice is done them at all times. With this genuine solicitude for the welfare of the men must go firmness and absolute impartiality.

In the internal economy of the organization, responsibility for the various portions of the work should be definitely located with each individual, but the regulation of minor details by orders should be avoided. Standing orders should be few and general in scope. Discipline should be administered within

the organization so far as possible. Men who might make good soldiers if properly handled may be ruined by having the first court-martial entered on their records. Extra fatigue, deprivation of passes, etc., should be used to the fullest extent before resorting to courts. The office of noncommissioned officer should be magnified, and a sharp line of demarcation between noncommissioned officer and private maintained. The necessity, under military administration, for a sharp differentiation between those in whom authority, in varying degrees, is vested, is not at first evident to the civilian, as a rule, neither is the nature of the line of demarcation plain. Regarding the former, the limits of our discussion today admit nothing more than the proffer of the advice to the medical man, who aspires to any measure of success in military administration, that he accept unqualifiedly the testimony of every man who ever transformed a crowd of men into an effective machine of any kind that such a differentiation is necessary. The nature of the line of demarcation depends on individuals and conditions. We learned by sad experience that a line of demarkation which is adequate among Americans is inadequate when we deal with Orientals. Further, measures which prove adequate in the hands of one man to prevent that familiarity which breeds contempt are not adequate in the hands of another.

Without attempting a full discussion of the subject, it may be noted that the idea that severity of manner and gruffness in dealing with inferiors are indispensable to discipline is erroneous. Forceful men of coarse nature sometimes manifest such characteristics in their maintenance of discipline, but forceful men of high breeding find no difficulty in attaining their ends without such means. While men vary greatly in natural ability to command, the

sine qua non of any degree of efficiency is a constant realization on the part of the superior that by virtue of his rank he is, for the time at least, superior to to those whom he commands. Those who, in dealings with those inferior in rank, assume a superiority one hour, which they do not themselves feel and which they forget to assume the next hour, make dismal failures as disciplinarians. It is needless to remark that an appreciation of the line between the noncommissioned officer and the private cannot be developed unless the line between the officer and the noncommissioned officer is also maintained.

Under most conditions, the detachment will be greatly benefitted by running its own mess. Occasionally conditions arise in which, on account of participation in large post exchange dividends, divided on the basis of the ration drawn, or because of some similar pecuniary advantage, the line organizations will temporarily welcome boarders from other organizations; but usually men attached to other organizations are made to feel that they are not welcome. On the other hand, there is no stronger force for unification and amalgamation of the detachment than that of having its own mess. For this and many other reasons, the detachment should run a mess whenever practicable.

The duty of the sanitary service of a regiment is primarily to conserve the health of the command in order that it may reach the firing line in vigorous physical strength, having suffered no depletion of the ranks by preventable disease. It has also subordinate duties such as the care and treatment of the sick and wounded, and the keeping of their records. Not infrequently officers of newly raised regiments, both medical and line, bring with them the conception that the care of the sick is the chief function of the medical officer and his corps of

assistants, just as it is of the physician in civil life. This conception, wherever it exists, must be eradicated.

The first duty which will ordinarily devolve upon the Surgeon of a newly raised regiment will be to instruct the entire command in the elements of personal and camp hygiene. The camp of concentration and organization should be fully equipped with all necessary facilities so that it would not be necessary to improvise or construct appliances at the start. The dangers incident to camp life must be fully explained to the men. Washing before going to meals must be insisted upon—the care of latrines, the handling of food, the disposal of kitchen and other waste, and the proper use of bathing facilities must be continually supervised by the Surgeon. His work will be facilitated if the commanding officers and the company commanders will co-operate with him by preventing the men from leaving camp except when absolutely necessary. The spectacle which is usually presented when troops are mobilized—of an almost empty camp and the nearest town filled with soldiers, wandering about aimlessly and eating and drinking promiscuously simply because time hangs heavy on their hands, is a disgrace to military administration. Unless the Surgeon be a man of high standards of duty, under such conditions he will feel that it is useless for him to put forth any effort to safeguard the health of the command. The responsible officers should see to it that every moment of the day of those first weeks in camp should be filled for the soldier, not with an endless succession of drills, but with periods of instruction so varied and so alternated as to make it possible to maintain interest. The practice march of three or four days duration offers one of the best means for the education of newly enlisted troops, not only because of the varied

instruction which it affords, but also because it occupies the time of the men fully, and keeps them under the surveillance of their officers. The hygiene of marching troops, the various methods of disposal of waste in camp and the preparing of food by the individual soldier can best be taught on a properly conducted practice march, while the recruit is becoming accustomed to his uniform and his pack, breaking in his marching shoes and while his officers are learning the elements of tactics. In many cases —probably in most cases—it will be advisable for the Surgeon to have some conferences with the Line officers, and in a tactful way point out to them the preventable causes of depletion of the fighting force and show how useless it is for the Surgeon to struggle against those causes unless he has the cooperation of the Company Commander. This action will be particularly necessary as regards efforts to prevent venereal diseases.

He may also find it practicable to secure the cooperation of the Company Commanders in the maintenance of a low sick rate by utilizing the spirit of healthy rivalry existing between the different companies by circulating from time to time a statistical exhibit of the regimental sick report, showing for each company:

Total number of admissions to sick report.
Total number of days lost.
Number of admissions and number of days lost from venereal disease.
Number of admissions and number of days lost from alcoholism.

The regimental commander, the battalion commanders and the company commanders will all note any marked variations from a normal average and will endeavor to locate the cause, which usually proves to be laxness in company discipline.

It is assumed that vaccination and the administration of antityphoid prophylaxis has been attended to at the time of the enlistment; if not, it will devolve upon the Surgeon to protect his command along these lines immediately.

In addition to all his duties as Sanitarian and Physician, the Surgeon is charged with those of Commanding Officer of the detachment of Hospital Corps. This brings us to the consideration of the last division of our subject—viz—the training of the sanitary personnel of the regiment. This training should be systematically directed to the definite end of supplying a complete and almost independent sanitary service in case the duty to which the regiment is assigned makes this necessary. When the regiment comes to the battle—the climax for which it has been trained—the sanitary service can do less possibly, at the moment than at any other time—and the conditions of modern warfare are diminishing rather than increasing the possibility of rendering much regimental aid on the battle field. While the regiment is a part of an assembled Division or even a Brigade, the functions of the Sanitary Service are relatively limited, because none of the sick are retained with the regiment and only a dispensary is maintained. But when the Division, of which the regiment is a part, is assigned the duty of occupying and controlling a given district in a hostile territory and the individual regiments are assigned sub-districts, and even the regiment is separated into battalions or possibly smaller bodies of troops and scattered over this territory, then the Sanitary Service becomes most extensive. The crucial test of the regimental Sanitary Service does not come, therefore, with the battle, but in the days of waiting—of inactivity—and especially when the regiment is cut off from the supplementary service of the Division. It is evident,

then, that the Surgeon must train his detachment with a view to the development of a service, capable of acting independently if necessary.

Since the requirements of the Sanitary service vary within such wide limits, it is evident that efficient administration will require varying assignments of personnel. No general assignment of the entire personnel can be made. For the purpose of our discussion today we may assume that the regiment is in a camp of concentration and is operating only a regimental dispensary, in which case a disposition of enlisted personnel along general lines might be made as follows:

Senior N. C. O.

General supervision of all, and in charge of records.

N. C. O. No. 2. (Not necessarily the second in rank.

Assistant to senior N. C. O. in the office,
In charge of property,
In charge of recruiting,
In charge of dispensary,
In charge of venereal prophlaxis.

N. C. O. No. 3.

In charge of sick call (and wards when in operation),
In charge of the water for drinking for the detachment.

N. C. O. No. 4.

In charge of police work for the detachment,
In charge of the picket line,
In charge of the enlisted men's inspections of
(a) Latrines,
(b) Bathing facilities,
(c) Preparation of drinking water in companies,
(d) Permits of venders.

Privates 1st Class and Privates.

1 cook,
1 assistant cook,
1 dispensary attendant,
1 office assistant,
1 messenger,
4 orderlies (officers'),
1 night attendant,
5 stable attendants (including wagoner and driver),
5 sanitary squad (under C. N. O. No. 4),
2 absent or sick,
Emergency squad to consist of dispensary attendant and office assistant.

To secure men capable of filling these positions, there should be instituted a course of instruction covering the various departments enumerated in the Manual of the Medical Department, viz., discipline and duties of the soldier, bearer drill and field work, care of animals and equitation, elementary hygiene, nursing, dispensary work, etc., and a rotation of duties in the detachment should be made with a view to giving a number of men training in each branch of work, so that the loss of a few men will not cripple the detachment.

After the work of regimental sanitation, the importance of which devolves upon the regimental surgeon, and for the time and energy expended it will yield him larger results than any other branch of his work. Wherever practicable, the instruction should be given by the medical officers. It is of the greatest importance that, during the first few weeks of service, until the men are well grounded in a satisfactory routine, they should be under the constant supervision of a medical officer from morning till night. Such supervision is ultimately a saving of time and energy, for it is so much easier to inculcate proper habits at the beginning than to substitute

them for bad habits once acquired. The service of a regiment in the field, especially if operating independently, affords the best opportunity for the development of an efficient Hospital Corps man. The ambulance company affords better facilities for teaching the drill, the duties of the soldier, and the care of animals, and a base or general hospital for teaching clerical work, nursing and pharmacy; but neither of these offer as wide a field for general instruction as the regimental detachment.

No reference has been made to the division of work among the commissioned personnel, because no attempt should be made to lay down definite rules regarding it. The surgeon will make assignments from time to time, being governed by the character of the work to be done and aptitude of his assistants.

In conclusion, nothing will conduce to satisfactory administration more than a careful and systematic study of Army Regulations and Army Manuals by the commissioned and noncommissioned officers of newly raised regiments. Many of the problems which annoy and perplex the surgeon who has recently come in the service may be solved by reference to these books, which, while not adapted to every situation, are the product of experience and much thought, and they have the power to make relatively light the work and smooth the paths of those who study them.

FIELD SERVICE SCHOOL FOR MEDICAL OFFICERS
Session of 1912

The Management, Duties, Difficulties, and Special Methods of Sanitary Service on Riot Duty

By Lieut.-Colonel Joseph A. Hall, Medical Corps, Ohio National Guard

The request to present this paper, coming from Major Munson as it did, brought more anxiety to me than the actual experience of handling sanitary troops on riot duty, but we realize that in the work of this school we must all give our efforts to make the success the course deserves.

There is no duty more distasteful which soldiers are called upon to perform than riot duty. It is also to be regretted that the first military force to be called upon at such times is the National Guard. They lack the confidence of the regular, which comes from familiarity with the service, and the independence of action arising from the fact that regular troops are not required to take orders from civil officers. These conditions have given the National Guard man a dread of riot duty. The militiamen at once acquire a decided distaste for riot duty because they are uncertain of the legal requirement of the duty. "They have not the slightest fear of a mob—they dread the *law.*" The uncertainty of protection

to themselves in the discharge of their duties is because the laws governing riot duty are so poorly defined, inconsistent, and in places contradictory. The most unfortunate part of the application of these laws is that they may be applied by either a civil or a military officer.

The proper performance of riot duty requires not only the adoption of a general and elastic plan, but an adherence to such a plan, which is the test of officers of ability. It must always be in mind of the medical officer in making his plans that the procedure is absolutely dependent upon the orders of higher authority. He must first determine and learn whether he is to care solely for his own people, or for any others who may fall into his hand.

PREPARATION

It is especially true of riot duty in the National Guard that when the call comes *it is time to go;* the time for preparation has then passed. Rapidity of mobilization is usually of the greatest importance. Property may be destroyed and lives lost while officers who have neglected to be prepared for such duty are making frantic efforts to repair the damage their own negligence has caused.

It is true that little good could be accomplished without the personnel; but it is equally evident that the personnel would be useless, if not really harmful, were they sent into the field without equipment. So in dealing with sanitary preparation, we must look carefully to both the training of the men, the system of notification, discipline, personal equipment, general equipment, baggage, stores and transportation.

The training of National Guard Hospital Corps men for any service differs very little from that of the men of the regular service; really the effort

is, insofar as we can, to follow the drill regulations of the Army as well as the course of instruction as given to the enlisted men. Our time is limited, however, in most instances to the proportion of as one hour is to eighty-four hours. During this period discipline must be inculcated as well as knowledge, first, of the arts of a soldier, next, the special training required to be a Hospital Corps man. From the foregoing, one can readily understand how necessary it must be to be exceedingly careful in the selection of the enlisted personnel for the Hospital Corps of any organization, whether it be for a detachment for line troops or for the larger sanitary units. Men of a really higher class mentally than that of the line must be chosen, if we are to accomplish the results we most desire.

SYSTEM

The statutes of various states differ materially in the matter of notifying the men for riot duty, but in the end the result in all states must be the same, so we may be permitted to adopt a system which will be a working basis for all. We believe that the statutes of all states direct that officers notify their men in some one of a particular manner for riot. Men so notified must *instantly* comply with an order so received or they may be punished by both the civil courts as well as the military. But the commanding officer must be certain beyond the question of a doubt that his personnel has been notified *as required by law.* In the excitement incident upon a call for active duty, it is imperative that each individual enlisted man receive a notice, which the man knows to be a legal summons to such duty. The enlisted man should also clearly and fully understand the penalties and disgrace for refusing or failing to obey such a notice.

The Field Equipment of the sanitary unit should at all times be kept in a secure place, which if possible is easily accessable to wheeled transportation. The equipment should *always* be ready for inspection and thus ready for immediate shipment. All chests, units, bales, etc. kept complete or as near so as possible. Tentage should always be kept carefully rolled and tagged, with tent pins rolled inside of canvas as prescribed. Tent poles tied in bundles kept in close position to tents. Kitchen equipment needs careful attention in the armory and should be inspected at least once a month by the commanding officer, and any corrections necessary made at once. All property of an organization to be plainly and perfectly stenciled.

TRANSPORTATION—WAGON

It is an easy matter in any city to make a contract with a transfer or moving company, for the use day or night, upon requisition for wagon transportation. This can be done by giving a contract for all drayage to one firm, and hold them strictly to account. By using this equipment for transportation during the camping period, the size of the wagon and capacity is known, and the number of wagons of a particular size can be called for by phone when a call to active duty arises. The wagons are at the armory by the time the first squad of men have reported for duty. These men, after donning their uniforms, are directed to report to the sergeant in charge of property, who will proceed at once with the loading of wagons. Care is exercised that kitchen equipment including tool chest is loaded first onto the wagons. When wagons are loaded they should be held waiting the marching of the organization.

TRANSPORTATION—RAIL

If the sanitary unit be attached to a line organization, the rail transportation will have been arranged for by the quartermaster of that unit, and he should have been advised of the amount of field equipment he would have to provide for transportation and use of the sanitary troops. Should the sanitary unit be that of a Field Hospital or Ambulance Company, the rail transportation must be arranged by the commanding officer or his representative. The loading of equipment into baggage cars requires some special attention, which however can be entrusted to a junior officer or even to the sergeant in charge of property. The greatest care should come in the loading of the kitchen equipment as it should be the *last* to go into the car.

The foregoing may appear to some as endless and needless attention to small details, which would naturally unravel themselves at the time of concentration. We speak from experience, when we say that not to follow them means embarrassment, chaos, and only partial efficiency when the call comes, but to follow them means confidence; both to officers and men; highest efficiency of the organization; facility of movement in the best possible condition; and the satisfaction of knowing that a disagreeable duty is well begun. An example: A Field Hospital located in a cit of 400,000 secure in thought that the state and all within were at peace. I read from the report of a commanding officer:

The commanding officer received a telegram from higher authority directing that he mobilize his organization for riot duty at once and proceed with all dispatch possible to another city, 125 miles distant.

12:35 Midnight—July 17th. Telegram directing concentration, First Field Hospital, O. N. G. received. System of calling officers and enlisted men of organization put into operation by telephone at once.

12:52 A.M. Omnibus Company notified to send four horse flat bed wagons to armory.

1:33 A.M. Reached the armory and found one sergeant and five privates there.

1:35 A.M. Wagons arrived.

1.37 a.m. Acting Quartermaster reports that he has arranged for baggage car and two coaches on B. & O. railroad to be "spotted" in Union Station on loading track at 2 a.m.

1.45 a.m. Men rapidly coming into Armory, donning their equipment and proceeding to company room. No excitement.

1.52 a.m. Lieutenant P. reports field hospital equipment loaded on wagons, and detail of one man left on each wagon. Wagons in line in front of Armory.

2.04 a.m. First call sounds.

2.07 a.m. Assembly.

2.16 a.m. Sergeant 1st Class reports the company with forty-four enlisted present, three absent, of whom one is sick in hospital.

2.20 a.m. Assistant to property sergeant directed to remain behind, locking up all lockers and remaining property and come forward on regular train in the morning with stragglers.

2.22 a.m. Company with four officers and forty-three enlisted men (six men on wagons), followed by the wagon train, left the Armory.

2.57 a.m. Arrived Union Station.

3.10 a.m. Wired Adjutant General would arrive about 6 a.m., giving strength.

3.12 a.m. Baggage and personnel aboard, and release signed by commanding officer.

Travel ration issued to men on train. Revolvers and ammunition issued to enlisted men on train.

6.32 a.m. Arrived West Broad Street Station, where we were met by a major, Quartermaster Department, and detrained.

6.[illegible] a.m. All baggage unloaded and train released.

Thus we are able to read between the lines, if we care to, in this laconic report, the words, "efficiency and preparation."

Marching through the streets of a riotous city may be a most dangerous proceeding to the troops arriving, and especially so if perchance the first organization is that of a sanitary unit. Under these circumstances, it might be well for the commanding officer to get into touch with a line organization and arrange the time for his arrival to correspond to that of the troops of the line. But where such an arrangement is impossible, it is well to have the personnel armed with revolvers and ammunition. Arriving at the destination, which should be at some little distance from the point of disturbance, detraining should be at a point not expected to be used. The detraining should be orderly, unloading of baggage rapid, and assembly of the company prompt and without confusion, whether in company and under the protection troops of the line or not.

Where no line troops are available, great care by the officers and patience by the enlisted men must be exercised. Men should be especially cautioned, under no circumstance, to resent by word or action any remark made by civilians. It is a most trying moment, and speaks loudly the word "discipline" to have men hold themselves in check, and hear words of the vilest character hurled at them by men, women and children. The organization must be held intact at all hazards. As soon as the property can be unloaded into wagons, a small detail on each wagon, with a commissioned officer seated on the front wagon, should precede the company. This formation gives protection both to the wagon train and to the men. The officers only should have their revolvers loaded. In an emergency a barricade

could be made of the wagon train, which would be quite effective for a considerable time. Confidence of the men and officers, promptness of action and quietness, reinforced by an ample exposition of Red Cross guidons, usually spells safety, provided all is done rapidly and in a thoroughly business-like action. Conversely, indecision, loud talking, slowness of action, a "running wild of enlisted men, lack of discipline will be noticed and taken advantage of quickly by the crowd of unruly, who are constantly looking for a chance to make a disturbance at such a time.

REPORTING TO SUPERIOR OFFICER

The commanding officer will have received in his original order the name of his superior, and should report to him in some manner, either in person or by telephone, as soon after arrival of his command as possible. He will be directed as to where to establish his station and how much of an establishment he will erect.

In case the sanitary personnel is attached to a line organization, the proposition becomes a much simpler one—that of following his line organization and establishing his sanitary outfit in a position to best care for the needs of his organization. The statutes of the various states, as well as the Constitution of the United States, expressly forbids the billeting of troops; therefore it is necessary to always be prepared to seek quarters under canvas. But for other reasons it is especially desirable on riot duty to quarter troops in tents, if the weather is not too severe. One reason is that where the camp is established the troops are more easily controlled, guard more easily maintained, sanitation, both general and personal, more easily carried out. The

writer is aware that it may seem a hardship to compel men to sleep under canvas with the thermometer near the zero mark, but by the placing of camp stoves and straw the quarters may be kept very comfortable. Again, we must consider the danger alway to be found present in riot duty, namely, dynamite. Buildings, no matter how closely guarded in a city, have been known to be destroyed by the use of such an explosive. But should the weather be such that it is necessary to take the troops indoors, it is most advisable to choose for such purpose public buildings, such as Court House, school buildings, etc. Where buildings of such nature have been taken for the purpose of quartering troops, the question of sanitation, so far as water closets and water supply are usually concerned, is assured by the permanent fixtures already at hand and in operation. Lighting facilities are also usually installed. It is but the matter of a few moments to arrange for bathing facilities for the troops.

When troops are to be encamped during riot duty, it is always advisable if at all possible to pitch the camp on some public grounds, if there are any of sufficient size to permit of such an encampment. This relieves all officers of seeking for further permission to encamp than the city authorities, upon whose request the troops are usually present. The ground around public school buildings, Court Houses, Libraries, etc., usually give good advantage for such camp, and in addition the closet facilities are at hand, as well as water. At times it may be necessary to camp inside of, or near some large manufacturing establishment, for the protection of its property. The same conditions of sanitary arrangements obtain, as are to be found in school buildings. Again it may be found necessary to encamp even in

the dead of winter among the hills and valleys of our coal mining regions, far away from the conveniences of a city. When such condition arises, the work of the sanitary personnel is more than doubled. Not only must the water supply be carefully tested, and watched, but the necessary field latrine must be established and carefully looked after. The danger here again arises of men living under canvas, of ventilation. It must be impressed upon each commanding officer of the various organizations the necessity for him to personally see *each* night that each individual tent has sufficient ventilation. The commissary supply becomes another source of anxiety to the medical officers, and constant friction exists between the supply and the sanitary departments, until higher authority is appealed to and gives a direction to the supply department, or an amicable agreement is reached between the two. This may seem strange to you of the regular service, who have your "army straight", but to us of the National Guard, who hear so often the direct command from the Commander-in-chief (the Governor): "Poor fellows, pretty tough on the enlisted men, such service. Are they getting enough to eat, General? Give them plenty, all they want; nothing too good for the men who serve their state," etc., and the damage is done, which may require weeks to straighten out and get into good running order again. In the meantime the sick report goes up and up and the medical department is blamed. Another source of danger lies in the company cook. Until a short time ago the company cook was the least thought of man in the organization. Usually a pick-up at the last moment or even found after arrival. Fortunately that condition has about passed, and now we find an enlisted cook in the kitchen, as jealous of his domain and capable in his profession as any man in the organ

zation. Good cooks, well trained, are really one of the greatest aids the medical officer has on riot duty.

THE SANITARY ARRANGEMENT WITH THE INFANTRY REGIMENT

The preliminary of mobilization and movement to point of action have been given earlier in this paper. The problems which the senior medical officer on duty with the regiment is called upon to meet, begin at the very outset, and may be anything from an attack of nostalgia to that of a gunshot wound of the abdomen. It is advisable, and in our service is ordered, that in addition to the personal equipment of the Hospital Corps detachment, a Medical and Surgical Chest for Detached Service is carried on each section of the troop train, which is accessible to the medical officers. Sanitary personnel, both commissioned and enlisted, are divided between sections of the train.

After arrival at destination, the regiment is usually directed toward its duty of preserving the peace, protecting life and property, and little is thought of for a time of a proper place for quartering the regiment; as is usually the case, there is more important work to be done. It is usual before leaving the home station that the senior medical officer will assign one junior to each battalion, with a sufficient Hospital Corps detail, this arrangement to be permanent during the tour of duty. The senior remaining on duty at headquarters with one battalion with its personnel. He becomes immediately responsible for the execution of all sanitary measures, and for the care and treatment of all sick and wounded of the command. In addition to these duties he is the medical and sanitary adviser of the Regimental Commander, and will carry out to the

best of his ability the provisions prescribed by the Manual for the Medical Department. Par. 602, 1911.

It will be necessary to establish a regimental hospital; and provision should have been made before leaving the home station, for sufficient equipment to make this possible. It is found, however, where rioting is in a city, that it is most convenient and better for all concerned, to make if possible, arrangements with some one of the large general hospitals, for the quartering and care of all serious "surgical or medical cases". One medical officer can then be assigned to duty at this hospital, to care for all cases sent there by proper transfer. This will relieve the regimental enlisted personnel for other and more important duty in case of sudden and serious emergency. It is also possible in case no ambulances have accompanied the regiment, to arrange through the city hospital for ambulance service. If a city hospital is unavailable, then the regimental hospital is the only alternative. If the weather be severe, it is best to establish it in some public or semi-public building rather than under canvas. If none other is available, a church can be made into a most comfortable regimental hospital. In case the stay is going to be of some duration, it will be necessary for requisitions to go forward and supplies received as early as this may be determined, so that the capacity of this hospital may be increased as rapidly as the circumstances may demand. It is highly important if the regiment stay together, that this hospital be established in a place of some prominence and easily reached. Proper markers should be placed and the location published in orders. It is highly important that a small operating room be immediately established, as it is usually within the first few hours or at least the first night on riot duty that

surgical cases will be met with, which will require prompt and efficient interference. If the city does not afford an ambulance service and none has yet arrived for use of the regiment, contract should be made with the owner of an automobile for his services when required.

After all arrangements have been made for the proper care of the sick and wounded, the senior medical officer should turn his attention closely to the care of the health of his command. The men should be forbidden to eat or drink anything not procured in their own camp; disobedience of this order should be met with severe punishment. Venders of all sorts should be forbidden within the confines or in the neighborhood of the men's quarters. The seductive ice cream cone, home made pies, etc., have caused a greater sick rate than all the so-called "embalmed beef" ever issued to troops. An investigation of the water supply should be made promptly, and if necessity warrants, orders should be issued for the boiling of all water. Care should be exercised to see that company commanders give especial attention to the feet of their men, as well as to personal hygiene. At the company kitchens a sanitary trench should be built immediately and a fire kept burning in it at all times, and all refuse, both from the kitchen as well as the company streets, placed on the fire and burned. If the city provides a garbage disposal system, contract should be made with them through the proper officials for the disposal of all waste and garbage. The garbage and waste water should be kept in air tight iron cans while awaiting collection. In this connection, it would be far preferable if, when a set of cans are full, they could be taken up and replaced by clean cans, and the emptying not done in the vicinity of

available, there is no alternative but the sending in of a complete field hospital.

It has been found most useful in this sort of service to have at least two orderlies mounted on motor cycles. In the city they can cover the ground much more rapidly and with greater comfort than horse mounted orderlies. Their use for the rapid transportation of the slightly wounded from an outpost or from a regimental infirmary to the field or evacuation hospital has been found to be most convenient, practicable and rapid.

The matter of sanitation becomes one of highest importance, and it is only by constant attention and greatest efforts upon the part of the sanitary inspector or inspectors that the health of the command is kept up to its highest state of efficiency.

The usual mode of life of the officers and men is changed immediately upon coming on such a tour of duty. After the first day there is rarely a time that disorder occurs during the daylight hours, but as darkness approaches, disorder becomes more pronounced as the night advances, usually reaching its height between the hours of 11:30 p.m. and 1:00 a.m. and diminishing as the morning approaches until dawn may find a riot strewn city again as quite as a country village. Officers and men become exhausted with the constant strain and loss of sleep, so that it will take very little to upset them physically, and constant attention and care upon the sanitary arrangements is the price demanded for the health of the command.

The surgical situations most met with in this form of duty is the result of dynamite or some kindred high explosive, but we may be called upon to attend anything from a blistered foot to a gunshot wound, *and our* greatest care should be exercised at all times

to be prepared and ready for any emergency which may arise. It will rarely occur, that when we are called upon to perform some of the more difficult surgical operations that there will be but one case, but there are usually several and at some times many. The tactical situations are rarely left to our hands, but no matter where we may be located it is necessary at all times to maintain a sufficient guard from the line to protect the personnel as well as the property of the Medical Department.

In closing, may we not venture the statement that the National Guard of any state is a constitutional and most important department of that state government, its function being, finally, to insure the perpetuity of the state as an organization by enabling the executive department of the state government to faithfully execute the laws provided by the legislative branch. The National Guardsman must, therefore, always remember that it is upon him, when the civil power has failed, the state relies for the vindication of its laws and institutions, imperiled from whatever cause.

The service which the Guardsman is thus called upon to render to the state is invariably of the most delicate and difficult character, requiring from him the highest type of patriotic devotion to public welfare; a thorough knowledge of his duties and responsibilities and also that he should constantly maintain a state of efficiency and preparedness which would insure intelligent and prompt response when called upon by the civil authorities.

The peculiar character of the service required to be performed, when acting in aid of civil authority, demands enforcement of the most rigid discipline and such exemplary conduct on the part of officers and men as will command the respect and confidence

of the people. Enrollment as a soldier has relieved him from none of the duties or obligations of citizenship. In volunteering his services as a Guardsman he is exemplifying the highest type of public duty which the citizen can render his state: hence, the importance and lofty character of his calling demands that the Guardsman on duty should not only present the ideal soldier, but also that his conduct and deportment should be such as will preclude criticism, and which will increase the forcefulness of his efforts to demand similar conduct from others.

FIELD SERVICE SCHOOL FOR MEDICAL OFFICERS

Session of 1912

THE AMBULANCE COMPANY

By Captain James L. Bevans, Medical Corps U. S. Army.

In 1702 Baron Larrey, Chief. Surgeon of the Army under Napoleon, first organized a real Ambulance Service. When Baron Larrey joined the army he found that the sanitary personnel and supplies were kept with the baggage trains about three miles from the firing line. High ranking officers, where possible, were carried back by their men, and such wounded as could reach the train by themselves were cared for. If the battle were lost, the wounded fell to the enemy; if won, servants, bandsmen and camp followers brought them up to villages, using the neighborhood transportation for the purpose. Larrey thought that the wounded should be treated during battle and demonstrated the usefulness of the Flying Ambulance Service. Baron Percy, of the same army, believed that since units of the Sanitary Service were not allowed on the field it would be well to convey the personnel and equipment to the front by vehicles which would not be in the way of other transportation. He therefore devised a surgical wagon drawn by six horses, which carried eight surgeons, orderlies instruments, dressings and litters. Halting in sheltered places this group gave aid to the wounded and sent out litters, carried in part by the orderlies and in part by combattants excused for the purpose. In 1813 the French Service represented a combination of the ideas of Larrey and Percy.

In the British service the Duke of Wellington disapproved the recommendations of his medical officers to imitate the methods of Larrey and Percy on the ground that troops would be hampered. The long continued wars of the period compelled the development of Field Hospitals, but the first conveyance corps was sent out at the time of the Crimean War and unfortunately failed because of heavy wagons, poor repairing facilities and the miserable class of men transferred from the line to join this special service.

A file of United States Army Regulations will show, to some extent, the development of the sanitary service in our own country. The Regulations of 1808 said nothing. The Regulations issued in November, 1814, on the duties of Regimental Surgeons, directed that a Medical Officer attend at the beginning of a march and designate the men who were to ride or have their haversacks carried in the wagons, but the wagons were not specified. A two horse wagon was assigned to each regimental hospital and this was to carry a medical chest of two hundred or three hundred pounds and three other chests to be provided with locks and keys and to contain blankets, bed sacks, cooking utensils and hospital stores. The Regulations of 1821, prepared under the direction of General Scott, gave clear directions for a Sanitary Service in the field. They were elastic enough to permit the Medical Department to use some discretion. The Medical Director was authorized to establish Field Hospitals and to organize and throw forward sections for transporting wounded, and to give aid as far forward even as the skirmish line. The Quartermaster's Department was required to furnish wagons after consulting the Medical Director. The control of the wagons did not pass to the Medical Department in the revised edition of 1825. The units mentioned

in the 1821 Regulations were referred to as Ambulances. After 1821 no wars occurred to keep alive interest in the Sanitary Service and the Regulations of 1834, 1835 and 1841 omitted all reference to the care of sick and wounded, except a provision requiring that a wagon be attached to the rear guard when necessary and practicable, and that a Surgeon attend to give assistance and see that no improper person was suffered to avail himself of the accommodations. No elaboration of a Sanitary Service was possible in the Regulations of 1847 because of the sudden onset of the Mexican War. Except for a serious dependence on the Quartermaster's Department for transportation, the Medical Department was administered without help or hinderance from the Regulations. From 1821 the Medical Department of the United States Army, unhampered by Regulations had advantages over that of other armies, but in 1857 Regulations appeared which limited the sphere of the Surgeon to that of attendance on the sick. In 1861, the Regulations were practically ignored and customs authorized by common consent finally crystalized into an excellent system.

Satterlee's report, dated January 5, 1838, gives probably the earliest account from United States sources of the administration and equipment of an Ambulance Service for the field. In 1859 a Board was appointed to consider various devices and vehicles for the transporting of sick and wounded. This body rejected all the devices submitted, and recommended an ambulance system rather than the adoption of any special devices. Major Richard Delefield, of the Corps of Engineers, reported to the Secretary of War in 1860 on devices seen by him in Europe for carrying the wounded.

The Act of Congress, dated March 18, 1864, tardily put into force the plan suggested by Major Let-

terman, of the Medical Corps of the Army, on which is based the Sanitary Service, not only of our own army but also that of all the great armies of the world. Unfortunately for us, in the interim between the Civil war and the war with Spain, the system, while steadily developed in foreign armies, was allowed to lie dormant in ours.

The Acts of March 1, 1887 and March 2, 1903, authorized the organization of Companies of Instruction and Ambulance Companies but Companies of Instruction were actually formed before the Act of 1903, and Ambulance Companies had been informally or temporarily organized during field service and at maneuver camps and the unit has been described in the Manual of the Medical Department as to personnel, equipment and functions, prior to 1911, but it was not until the Surgeon General's letter of April 7th, approved by the Secretary of War on April 17th, of that year, that Companies of Instruction were abolished and Ambulance Companies and Field Hospitals came into real existance.

AS TO ORGANIZATION IN PEACE

Field Hospitals and Ambulance Companies are utilized in garrison so far as practicable in teaching recruits temporarily ordered to these organizations by the Surgeon-General.

The joint commissioned and noncommissioned personnel consists of four officers and eighteen noncommissioned officers who are available as instructors. The forty-five privates allowed in the permanent personnel of an ambulance company is of sufficient size to permit of the training of men for all of the technical and more important positions occupied by enlisted men in an ambulance company and the same applies to the twenty-seven men allowed a field hospital. The commanding officer of the joint or-

ganization is required to conduct the course of instruction and to assign instructors from both or all of the units serving at the same fixed post. Autonomy for each separate unit is maintained. The discipline and interior economy of the organizations conform to those of a company of infantry; the equipment in barracks is the same as that for companies of the line. The course of instruction for recruits covers a period of four months.

Only officers who have served with the abolished schools of instruction of the Hospital Corps know the difficulties encountered, reaching a maximum at the time of field service. The schools had as cadres, besides officers and noncommissioned officers, twelve privates. The equipment of a field hospital and ambulance company, without transportation, was stored. The four classes consisted of recruits in varying stages of instruction. When the occasion for field service arose, orders usually required that the company be split for duty at two maneuver camps, each half to furnish the personnel of a field hospital and an ambulance company. The transportation, if it appeared at all, came from all sorts of sources. The officers of the school, if fortune had favored the organization with more than one, were separated, and new ones added to piece out the personnel. Strange duties and methods of administration did not improve the work of the already bewildered recruit. Higher authority invariably expected more of the organization than it was prepared to give under the conditions. The paper work of the school had to be kept up and yet the clerical force, already divided between two camps, had ambulance company and field hospital records added to its burden. Besides, the voluminous files of the school could not be taken to the field and frequent reference to them was necessary if efficient office work was to be maintained. The

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esprit de corps of the company, always difficult to maintain in a recruit organization, was broken by the frequent changes; discouragement was the universal feeling, and training of the units was impossible.

After the change of April 1911, establishing field hospitals and ambulance companies and abolishing companies of instruction, some of the difficulties were straightened out and the Manual of the Medical Department has still further perfected the organization. The forthcoming manual for the field units will doubtless end the confusion as far as it can be ended in the absence of definite organization, putting the units on a basis similar to that of other units of the army.

Under the provisions of the Manual for the Medical Department for 1911, and later orders, ambulance companies and field hospitals in garrison belong to the mobile army. Paragraph 150 requires the commanding officer of each unit to distribute its administrative and military duties among his subordinates and to retain for his organization autonomy as a separate and distinct administrative and tactical unit. If only one unit is present in a post, the commanding officer will have no difficulty in following these orders and carrying out a course of instruction for recruits temporarily assigned. When two or more units, however, are present, the senior medical officer is not only commanding officer of one of the units but is required to conduct the course of instruction for all as if they were a single organization. He also has the duty of assigning graduates from the school to the permanent personnel of the units. As the companies are now conducted, the chief garrison function is that of the school. The senior medical officer, if he is not actually partial to his own unit is at least under the suspicion of being so, and this condition will lead to friction. If the units are to con-

tinue to be schools of instruction, a useful change will be to have the senior medical officer in command of all the units but not assigned to any one of them. He will then be in the position of a battalion commander. His office will maintain the records of the school. He will conduct the school, making such details of commissioned and enlisted personnel as may be necessary, and assign the graduates to the permanent cadres of the units and recommend men for transfer to other organizations. In case of field service he can easily be assigned to a particular unit. The school records and property can readily be left behind under charge of an officer or noncommissioned officer with a small guard and clerical force, the units becoming independent on departure from garrison.

An apparently better plan and the one here recommended is to separate the schools of instruction for the hospital corps from the units. Schools of instruction should be assigned to recruit depots and become recruit companies and all men for the hospital corps should receive instruction therein according to a uniform plan. Selected graduates from these schools should be sent to general hospitals for a short post graduate course given also under a uniform plan. The units, definitely organized by law, should be assigned to stations with the mobile army. Every officer and every man could then be instructed in the duties of his own position and that of the next higher. The tour of duty of commanding officers should not be greater than two years and as many recently commissioned officers as possible should be given the opportunity of a short assignment as juniors. The units, thus organized, freed from school duties except such as pertain to the training of the permanent personnel, would offer admirable places of training for field work and the instruction of young officers

in the military part of their duties. In answer to the objection that the men of units so organized will have nothing to do during peace times, one may confidently reply that an ambulance company has the same good reason for being prepared for war that any other part of the army has, and with transportation and equipment to care for and training to maintain it will be as busy as any. It has been noticed also that wherever these attractive units are brought in contact with troops of the line there at once ensues a fellow feeling which promotes the cooperation and coordination between the services which is desired by all.

Several minor matters require attention if the organizations are to be continued on the present basis in garrison. Adequate, separate barracks are necessary for efficient, autonomous administration with school rooms in addition. The stables and store rooms should also be separate to avoid confusion on departure for field service and commodious enough to allow of demonstration for instruction purposes. The messes should be separate as a matter of training but if joined new regulations are required as to the management of the funds, with an ample income in the field and a meagre one in garrison. The ambulance company presumably has a company fund. The plan which has been worked out for the organizations at The Presidio is working well. The field hospital allows the hospital fund to lie dormant during service in garrison, using it under the usual regulations in the field. The joint ambulance company and field hospital operates a company fund and mess and holds ownership in a Post Exchange and other property. All the officers of both organizations act on the company council. In case of field service a convenient amount would be invoiced to each unit commander, balances to be credited to the mother

fund on return to garrison. The greater readiness with which a field hospital acquires an income should be considered in regulations concerning the funds of the units.

AS TO ORGANIZATION IN WAR

A normal division has four ambulance companies, a cavalry division, two. Independent divisions and brigades have the necessary number. A field army is composed of two or more divisions and the necessary auxiliary troops usually including one ambulance company. The auxiliary troops, minus the cavalry, are ordinarily united so far as administration, marching and camping are concerned, into an auxiliary division placed near the head of the line of communications.

Ambulance companies are sanitary formations accompanying the mobile forces and are not ordinarily attached to units smaller than a division; they are also called independent sanitary units. They are numbered from one up in a single consecutive series. While with mobile forces, they are further designated by adding the designation of the division or other unit to which assigned.

The command of the ambulance company is determined by the usual rules for other organizations but for emphasis it is repeated that the ambulance company is not usually assigned to units smaller than the division. So far as the special service of the Medical Department is concerned the channel will be from the Surgeon General of the Army to the Surgeon General of the Field Army, thence to the Chief Surgeon of the Division and from him to the Director of Ambulance Companies, and finally to the commanding officer of the unit.

PERSONNEL

The personnel of the ambulance company consists of five medical officers, one captain and four

first lieutenants; nine non-commissioned officers, two sergeants first-class and seven sergeants; one acting cook; and sixty-nine privates first-class or privates. For the infantry division a major is added as director and a sergeant and private first-class or private pertain to his office. The medical officers and thirteen of the enlisted men are mounted. The director has a mount and a led horse and the sergeant and orderly who accompany him are mounted.

In each ambulance company it is ordered that one lieutenant, one sergeant first-class, one sergeant, one acting cook and ninteen privates first-class or private shall accompany the wheeled transportation. Of the privates one is farrier, another is saddler, two are musicians and fifteen, drivers. The senior medical officer with an ambulance company or a detachment of one is the commanding officer. The manual has wisely refrained from placing limitations on the organization of the personnel. The commanding officer will be able to take full advantage of his freedom in making assignments as varying conditions require.

TRANSPORTATION AND EQUIPMENT

In studying the equipment of the ambulance company one must remember that it is a unit performing certain functions and a company which must itself be kept in a high state of efficiency. The collection and carriage of the wounded with care as to shelter, food, medical and surgical attendance, and comfort, en route, and enough paper work to protect the future interests of the Government and the patient, are the functions. To do these things well the men and animals must be sheltered and fed, supplies must be guarded and replenished, vehicles must be repaired and all the necessities of a company attended to on the march, in camp and on the battlefield.

In garrison, a fully equipped ambulance company can be housed comfortably so far as transportation and equipment is concerned, in a stable, with sheds and two store-rooms. The personal baggage of the five officers and the field and surplus kits of the seventy-nine men are not considered because they are with the personnel in quarters or barracks. There are eighty-two animals and fifteen vehicles. One of the store-rooms should contain the harness fiitted and marked for certain mules; the packs ready for their load of grain, two hundred pounds to the mule; the horse equipment on pegs, covered with bags to contain them in case of a railway journey, also marked for a certain person and mount; and on pegs or in compartments or groups distinctly placarded, the spare parts and accessories which it is not safe to leave in the sheds with the ambulances and wagons. The second store-room contains the remaining equipment divided into three wagon loads, the first one of the dressing stations being divided into sub-groups for pack mules in case light transportation is ordered. Gunny sacking suspended as curtains between the loads does well in marking the groups.

Field Service Regulations say that ambulance companies and field hospitals generally camp like battalions of artillery with the transportation between the units but usually the plan given in Mason's Hand Book, slightly modified, is followed. On one side perpendicular to the base line are the guard tent, the packs, the ambulances and wagons at appropriate intervals. On the opposite side of the camp are the officers tents, the kitchen and the company street. Between and parallel to these two lines is placed the picket line, thirty feet from the ambulances.

OFFICIAL LISTS

The official lists of transportation and equiment are given in the Manual for the Medical Department.

An analysis of these lists will reveal some defects but will show in the main that the ambulance company is not only well able to take care of itself and to perform its duties if well administered, but that it is over supplied.

To form an idea of the total equipment, one needs to add the items from all sources together and study the result. This has been done and an abstract of the findings follows. The lists are not at all complete, but when an item is mentioned at all, the total number of that particular article on hand is given. It is to be understood that all of the items of equipment, even those carried by the men, have been included.

SURGICAL INSTRUMENTS, DRESSINGS AND APPLIANCES

Instruments, assorted	an over abundance
Bandages, gauze	1334
Gauze, sublimated	1052 yds.
Bandages, plaster Paris	126
Cotton, absorbent	298 oz.
Plaster, adhesive	2168 yds.
First-aid packets	480
Wire splinting	92 yds.
Wooden splints	48
Tourniquets (various forms)	70
Bottles with rubber stoppers	108
Iodum	1190
Alcohol	12 oz.
Tracheotomy tube	1
Basins, white enamel	3
Buckets, white enamel	3
Basins, rubber	2
Brushes, hand	8
Cup, white enamel	1
Bag, rubber, hot water and syringe	1
Aprons, rubber	2
Gloves, rubber	2
Inhaler, chloroform	1
Razor	1
Soap, green	2 lbs.
Soap, germicidal	2 cakes
Drainage tubes	2 pieces
Alcohol burner	2
Alcohol, denatured	20 qts.
Chloroform	4½ lbs.

This list shows that there would be enough dressings for any demand likely to be made of an ambu

lance company. Immobilization of fractures might have to be done in part by improvised splints. Tracheotomies are mentioned as among the operations to be done at the dressing stations, but these can be performed without tubes. Only twelve ounces of alcohol are provided for 1190 grams of iodine so far as the supply tables show. There is a serious shortage of rubber gloves. The chloroform is in small quantity.

STATIONERY

Diagnosis tags	44 books
Blank books	2
Eraser, rubber	1
Pads, letter	2
Pads, perscription	4
Paper, legal cap	2 qrs.
Paper, writing	4 qrs.
Paper, note	2 qrs.
Pencils	10
Pens	24
Penholders	2

Every organization in the field has diagnosis tags and forty-four books of forty tags each appears to be enough of this usually scarce article. Even counting the officers' note books there will be an insufficient number of blank books, pads and pencils for the many entries which will have to be made for the records of a battle. The pens and pen holders are wholly inadequate.

IMPLEMENTS

Hatchets	16
Axes	11
Pickaxes	5
Shovels	2
Spades	5

These articles are hard to pack, heavy, and easy to replace. They are ample for all purposes.

LIGHTS

Lanterns	47 plus 3 folding
Extra glasses for	15
Oil, mineral	12 tins (size not given)
Candles	15
Lamps, acetylene	6
Calcium carbide	60 lbs.

Fifteen extra glasses for forty-seven lanterns are not enough. Twenty-seven of the lanterns are carried with the transportation suspended beneath the vehicle and are very liable to breakage.

SHELTER

Tent flies, wall, with poles	4
Tents, hospital, complete	2
Tents, wall, without flies	2
Tent flies, hospital, without poles	2

This is the allowance for campaign. The two complete hospital tents are for the kitchen and the guard or property tent. It is believed that the wall tents for officers under the present restrictions will be dropped early in the campaign, because a single shelter tent will prove more comfortable than a wall tent without fly occupied by three persons.

HOSPITAL STORES

Arrowroot	32 lbs.
Beef extract or liq.	296 oz
Brandy	12 qts.
Chocolate, sugared	40 lbs.
Condensed milk	90 lbs.
Malted milk	38 lbs.
Matches	150 boxes
Pepper	14 oz.
Salt	44 oz.
Sugar	72 lbs.
Tea	8 lbs.
Cinnamon	4 oz.
Nutmeg	4 oz.
Rolled oats	12 lbs.
Soup	24 lbs.

If the cook accompanied the dressing station instead of staying with the ambulance company train his results would be about as follows:

Blanc Mange	960 dishes
Beef tea	1184 cups
Soup	96 cups
Milk punch	384 cups
Tea	384 cups
Malted milk	304 cups
Oatmeal porrige	60 dishes
Oatmeal gruel	120 cups
Chocolate	640 cups
Total	4132 cups

The recipes follow:

BLANC MANGE

Sugar	20 lbs.
Milk	16 lbs.
Arrowroot	32 lbs.
Nutmeg	1 oz.
Cinnamon	1 oz.
Salt	2 oz.

This could be served as a hot liquid or a cold, solid dish.

BEEF TEA

Beef extract	296 oz.
Salt	16 oz.
Pepper	10 oz.

MILK PUNCH

Brandy	12 pts.
Sugar	12 lbs.
Milk	20 lbs.
Salt	4 oz.
Nutmeg	3 oz.

TEA

Tea	8 lbs.
Milk	6 lbs.
Sugar	6 lbs.

MALTED MILK

Malted milk	38 lbs.
Salt	8 oz.
Sugar	6 lbs.

OATMEAL PORAGE

Rolled oats	6 lbs.
Milk	10 lbs.
Sugar	12 lbs.
Salt	4 oz.

OATMEAL GRUEL

Rolled oats	6 lbs.
Milk	10 lbs.
Sugar	10 lbs.
Salt	16 oz.

CHOCOLATE

Chocolate	40 lbs.
Milk	28 lbs.

The present official lists omit a Red Cross flag for the ambslance company. The travois is also omitted. There is a serious lack of agreement in the manuals of the various departments. For instance, General Orders No. 95, 1908, modified by General Orders No. 120, 1910, gives the latest lists of supplies furnished by the Quartermaster's Department. This considers the ambulance company as a section of the field hospital. Circular No. 18, of the Quartermaster's Department, of later date than the Medical Manual of 1911, also omits mention of the ambulance company. The escort wagon as given in paragraph 907, Manual for the Medical Department, is not supplied with an eight gallon water keg. The difference in the allowance of tentage is perhaps as striking as any of the discrepancies.

TRANSPORTATION

In 1877, Otis, of the Medical Corps of our Army, submitted a remarkable report to the Surgeon-General. Among the means of transportation, he considered litters carried by men, wheeled litters, conveyances borne by animals, and conveyances drawn by animals. Otis prophesied that the litter would be perfected to serve as a stretcher and a bed and would have attachments including wheels, springs, devices to enable either man or animal to haul it and would be adapted for packing on mules or suspending in ambulances. He brought out the fact that the word "litter" is derived from "lectica", "lecticus", bed, and that it was originally a vehicle used for the carriage of the rich. The palanquin of the Far East is its modern prototype. Horse litters were much used before coaches came in; the kings of Bithynia are said to have invented the litter. The two horse litter is known to have been used in the 16th Century. It was used in our wars in Florida and to a slight ex-

tent in the Mexican War. Camels were used for transportation in the United States Army in Texas and New Mexico. They thrived, multiplied and did good service, but were dispersed at the time of the Civil War although one or two remained at posts in Arizona as late as 1870. The value and practicability of the cacolet had been abundantly approved in France, during the Crimean War and in Mexico. It failed when tried in the United States because of the lack of good mules and packers. The mules need to be large. They can be used for supplies one way and patients the other.

It is said that during the Russo-Japanese War the Japanese employed 135,302 coolies, their work being supervised by litter bearers of the army. Mules for bearing wounded were found to be easy and comfortable, but leaders for them had to be employed, and two mules with the owner cost as much as four coolies. It is reported that the following wounded were moved by the various means of transportation:

By litters, wagons or mules	86,819
By boat	2,081
By jinrikshas, light engines or ordinary railway cars	79,427

THE AMBULANCE COMPANY

A fully equipped ambulance with a driver and orderly, four litters and a jockey box full of supplies can be taken long distances, making comfortable camps every night. It also provides very considerable amounts of food and surgical supplies for many wounded men. With the present equipment, the ambulance by itself may be the center of much sanitary activity, serving as a small dressing station, a shelter, a source of food, heat and light, a repair shop and a supply depot in emergencies.

Tweedle, of the British service, has said that in addition to the ordinary requirements of space, weight, etc., the ideal ambulance requires (1) four wheels of equal size and the largest possible diameter; (2) the longest possible wheel-base, 9 feet and 1 inch being recommended; (3) good springs which bear a relationship to the load. Springs are usually made to act best with the maximum load. Comfort is most needed by recumbent patients but four recumbent patients represent the minimum ambulance load. He therefore suggests combining recumbent and sitting up cases in such a way that the usual load will be somewhere between the present maximum and minimum.

The usual American requirements for an ambulance have been sufficient strength to stand rough usage, lightness, ability to turn in a space equal to the length of the ambulance, comfort whether full or partly so, to travel in rough, sandy or muddy country, and to accommodate sitting up or recumbent patients or part of each. It should be built to carry dressings, food, water, effects of patients and other accessories and spare parts. The two wheeled ambulances used by foreign armies were tried by us in the Civil War but the roads in this country did not favor their use.

The body of the latest type of ambulance is high and it is easily turned over when the upper berths are loaded. Except with expert drivers many poles are broken during rough service. The poles could be improved by the attachment of bull-rings as in the escort wagon, the goose-neck alone allowing too much jerking. Of the spare parts, the boilers, although mentioned in the 1911 Manual, are not now furnished. The whip socket is placed so high that it cannot be reached by the driver. If coal oil is furnished in the usual five gallon can as in the past, much

trouble will result. The can is weak and leaks within a few days. The tops of the cans are made in different ways and the jockey box cover jams some of them. The size of the monkey wrench is not specified and there is difficulty in obtaining the proper kind. The present tops are easily torn. It has been suggested that the ambulance should be provided with a curtain on each side of sufficient length to allow it to be pinned to the ground, thus giving protection to a considerable number of men. Some author has said that under certain conditions of emergency an ambulance company might be regarded as a 48 bed hospital, 12 ambulances or wards of 4 beds each.

THE ESCORT OR FIELD WAGON

The three wagons forming a part of the ambulance company train are in all respects like the wagons of the army in general. The load of the wagon is three thousand pounds. None of the loads of the ambulance company exceeds this limit. The escort wagon affords a useful means of transporting wounded. By dovetailing the lower extremities of the men, four recumbent cases can be carried. Certain rules regarding the carriage of sick and food supplies in the same wagons will be among the sanitary measures necessary in wars of the future.

The method of distributing the loads given in the manual seems to be admirable. The package of blacksmith's and farrier's tools, however, weighing six hundred and fifty pounds should be divided.

The fact that forage for nineteen mounts is included in the load for wagon No. 3 may be an indication that it is intended to increase the allowance of mounts for enlisted men from thirteen to fourteen and that omission of reference to it in other lists was a clerical error.

THE PACK MULE

The pack mule requires an essay all to himself. Four are allowed the ambulance company. They should be large enough to bear their loads and well trained and gentle enough to permit of their being used for the travois, the cacolet or the Arab basket and the two mule litter. The four mules should be of uniform speed but they must be trained separately.

THE LITTER

The persistence of the present type of litter shows that it is good.

Among improvised litters made official by mention in the Drill Manual are those from cots, shutters, doors and ladders, padded; those from poles and bags and bed sacks properly ripped or cut or from poles and rope or rawhide. The blanket litter made with rifles or poles is fully described as is the one made with blouses.

The literature is full of reports on improvisations of the litter. The travois is mentioned by early travelers among the Indians. The colonists carried wounded by it as early as 1763. Lewis and Clark used it in 1805. Greenleaf reported on a combined travois and hand litter in 1874 and placed a sample in the Museum in 1876. Cleary reported in 1875 on a travois litter. Havard suggested that a narrow two-wheeled truck be added to the rear of the travois. Wheeled litters are of many types; they usually have two wheels and require one bearer. The type used in the Boer War was excellent; it had two wheels, elliptical springs, a removable litter and was ball-bearing; the wheels had steel spokes and rubber tires. Litters may be slung from the pack saddle along the sides of the mule.

The patient may be carried in a recumbent or semi-recumbent position on the back of an animal by

means of the McEldery type of litter or by a crutch like that of Hathaway.

The two-horse litter of the Philippine Islands is easily improvised from two poles each 16½ feet long and two cross pieces. It is very comfortable but requires two animals and two men and cannot be turned in narrow places.

A new method of improvising a blanket litter has been proposed by Siluer of the British service:

Place the blanket on the ground and under its corners and twice along its sides place small stones, puckering the blanket about them. With eight four-foot lengths of small rope, tie the puckered-in stones with the clove hitch. Tie the ends of the ropes into loops with reef knots and suspend the blanket on two poles. The litter is easily made; it is warm and fits the body of the patient. When used with one pole, instead of two, as can easily be done, it is practically rain-proof. A drawing of this litter is given in the Journal of the Royal Army Medical Corps for November, 1911.

An excellent blanket litter can be improvised by making a wooden handle in the form of the stirrup on an English saddle, or the stirrup itself can be used, the corners of the blanket being tucked through the narrow part which is intended for the stirrup loop. The hand clasps the stirrup tread. The Germans fix the blanket more securely by puckering the blanket around the knob of the helmet.

HAND METHODS

The single bearer methods of carrying a wounded man across the back, astride the back and in the arms are official. The double bearers stand either on the right or left side or one at each hip, or one at the head and the other between the thighs. A method of mounting a slightly wounded man on

horseback is also officially recognized. These comprise nearly all the good single and double bearer methods which have stood the test of time. Captain J. S. O'Neil, of the British Royal Army Medical Corps, has recently described an excellent auxilliary use of the puttee. His first method is by means of one puttee which is placed under the buttocks of the patient, well forward, the ends tied in a reef knot; the bearer stoops in front, puts the puttee over his forehead, and carries the patient astride of back. Another means is by the use of two puttees: the first is used as above or around the nape of the neck and over the shoulders instead of over the forehead; the second puttee goes around the middle of the back of the patient, under the arm pits and over the front of the chest of the bearer whose hands are thus freed.

A combination of rifles and puttees is useful. Remove the load and bolt of two rifles; tie two puttees together and apply them to the rifles, using the single hitch in such a way that the puttees form the bed of a litter 44 inches long and 15 inches broad. The two puttees are sufficiently long to zig-zag across from rifle to rifle nine times. Over rough country the rifle slings and a bandage serve to bind the patient to this rough litter.

A method for carrying wounded, more or less comfortable, in rough two-wheeled carts, such as the Scotch hay carts or the ox carts of Mexico or Cuba, was described in the Journal of the Royal Army Medical Corps for July, 1910. It was first devised by the Germans, but it has been used at British maneuvers. A pole is attached to one side of the rear end of the wagon and slanted forward at an angle of forty-five degrees to the bottom of the wagon. A similar pole is attached to the same side of the front of the wagon and sloped back at the same angle. These poles are fastened

at the rear and front by lashings and where they cross at the center of the side of the cart they are also lashed. A similar arrangement is made on the other side of the cart. At an appropriate level above the cart, four loops are fastened to the poles to hold the four handles of the litter. A patient can thus be carried comfortably on these crossed flexible poles and another man, less severely wounded, can be transported in the bed of the wagon.

The cacolet mentioned before is a saddle with a seat on either side. The experience of the Civil War, where it was tried, was adverse probably because of the lack ef trained animals. It would not be used except in countries without roads.

A jinriksha can be readily adapted to the carriage of wounded, and the Burma cart; a two wheeled vehicle with springs, which can be hauled by one or two men or by one or two animals and of which an excellent drawing is given in the Journal of the Royal Army Medical Corps for November, 1906, is regarded as an excellent means of attending Cavalry.

EQUIPMENT

Another list such as appeared earlier in this chapter is added.

Buckets, G. I.	19
Tanks, water	24
Chamber pot	1
Bed pan	1
Spit cup	1
Urinal	1
Teaspoon	1
Bed sacks	18
Blankets, gray	18
Blankets, rubber	12
Pajamas	12
Pillow sacks	12
Towels, hand	18
Stools, folding	2

more units are stationed together. The school exacts attention and its schedule fills each day leaving little time for officers and men to give to the work of the unit. But bad as the present scheme is, it is better than none at all and persistent selection and training of men, constant attention to transportation and equipment, with skilful company administration, even in the face of the present difficulties will do much toward the development of a future service and something in the way of present preparation for possible field service.

At camps of concentration, company administration becomes really autonomous and should rapidly become very effective. Training under the supervision of the chief surgeon of the field army or lesser organization, continues. Inspection of personnel and equipment and administration comes into the hands of the sanitary inspector and the benefit of understanding should be apparent immediately. The advantages of association with other units of a similar sort will also be felt on concentration and the camp of the sanitary units of a division will be most favorable ground for enthusiastic training.

During war time the duties of training new men, inspecting equipment, and administering the company, not only continue but become matters of vital importance. Animals must be given vigilant care. Supplies must be replenished. Unfortunately also, the probability of shortage in personnel, transportation and equipment must be faced. It is perhaps true that the constant scrambling for men and transportation to which medical officers are habituated even in maneuver camps, will come into good play in war time and make them experts in improvising sanitary units from the resources of the country.

An obligation to reduce the hardships of troops to a minimum rests on all in the service and the care

the lanterns in about ten hours. The oil is carried in the jockey boxes of the ambulances. When the dressing station is transported by wagon and stays with the ambulances, its ten lanterns can be supplied, but when it is separated from the train and sent forward on pack mules the six lanterns carried in the left pannier of the second mule will have to be empty to protect the dressings also carried there and no oil is supplied to fill them.

Both of the alcohol burners at the dressing station can burn continuously for twenty-six hours with the alcohol carried on the pack mules and eight quarts will still be left with the wagon in park, the single stove burning one quart in about four hours and a half.

The question as to whether or not a commode chest should be carried has been a favorite subject of discussion for a very long time. If it is necessary its form could easily be changed. The objection to it is the same which obtains in regard to the detached service chest, the bedding unit and the general operating case, that it was made for another purpose. It is difficult to pack and the number of utensils is limited. There is no doubt that any manufacturer could readily devise a nest of utensils of graduated size which would serve as spit cups, urinals, bed pans and basins. The material might be of white enamel, readily disinfected, or better still of material like papier mache which would be light to carry, easy to replace and which could be burned.

There is a real shortage of utensils for holding water at the dressing station, when it travels with light transportation. A reference to the lists shows that there are three G. I. buckets, three white enamel buckets, two camp kettles and three wash basins, together with two rubber basins and the

small cup of the detached service chest. The two camp kettles are apt to be forgotten when the time for changing the dressing station from heavy to light transportation arrives because, they are a part of the field range packed in the second wagon. When one considers the number of men to be attended at a dressing station after a great battle it appears certain that there will be a shortage of utensils. The mess outfits of the wounded and of the sanitary personnel are not forgotten in making this statement.

These notes on equipment at the dressing station should not be closed without reference to the whistle and the dog as used in searching for wounded. A French authority has suggested that every soldier be supplied with a whistle of distinctive sound so that if wounded he can attract attention at night. A combination whistle and identification tag has been devised.

Dogs have been used little if at all in the American service. The literature seems to show that sporting dogs are not good for use with ambulance companies, because they stop to hunt game. The sheep dog is the best. A dog trained to bark is good only for day use, because several barking at night lead to confusion. Dogs work better during night than day. Bright lights, such as the acetylene lights now used, interfere with the work of dogs.

DUTIES

The manual gives the objects of medical administration in campaign and states that the most important task is the removal of the sick and wounded to avoid hampering military operations and to transport them by proper personnel to avoid losses of effectives at the front.

The ambulance company has for its share of these functions, the collection of the sick and

wounded of the mobile forces, transportation of them to the field hospitals, the care of patients en route, furnishing the necessary supplies; and it must preserve its mobility and keep constantly in touch with the troops. The early treatment of the wounded afforded by the ambulance company does much to return wounded men promptly to the front. Military leaders of the future will gratefully acknowledge that this trim, elastic unit of the sanitary forces has added materially to the morale of the troops. Specifically stated, the duties of the ambulance company are:

1. To establish and operate the dressing stations.
2. To help the regimental personnel at the front.
3. To carry the wounded on litters to the dressing stations or the furthest point reached by the ambulances, and thence by ambulance to the field hospitals.

At permanent posts, little has been possible in the past, in preparing ambulance companies for war. Without transportation and manned by recruits under temporary instruction in the schools, the work has been discouraging. With the four companies now organized, conditions may improve. An effort should be made to select proper men to fill up the peace strength, and they should be trained, not only in the general duties of the Hospital Corps, but for specified positions in the company. Under present conditions as to pay it will be found difficult to obtain men competant to act as horseshoers, saddlers or buglers. If animals are furnished they should be trained and this applies particularly to the pack mules. It goes without saying that the equipment must at all times be complete and arranged to move out with speed and exactitude. As long as school duties are required of ambulance companies, autonomous company administration will present great difficulties when two or

the saddle, but there are only thirteen mounts. It has been suggested that perhaps the mess sergeant is to ride on a wagon but this is an error because there is at present no mess sergeant.

Major Munson in his recent "Principles of Sanitary Tactics" gives an arrangement of personnel of which the above is a slight modification. He says that an ambulance company marching into action would be about as follows:

(1) Company commander and trumpeter with orderly pouch.

(2) Litter bearer section of one officer, five sergeants, one orderly and forty privates with twenty litters.

(3) Dressing station section of two officers, one sergeant first class, one sergeant, ten privates of whom two are orderlies, one is cook and four packers with the four mules and dressing station supplies, one dressing station supply wagon and driver.

(4) The ambulance section of one officer, one sergeant first class, one sergeant, twelve drivers, three privates, as musicians with orderly pouch, saddler and farrier, twelve ambulances with mules.

(5) Two wagons remain with the train.

At first the litter bearer section, with large perpersonnel, would be fully occupied, while the dressing station would have enough men to establish it and dress the few wounded arriving early. From time to time the company commander would detach litter squads to aid at the dressing station until finally the whole party would be concentrated there.

The peace organization has been given as one captain, one lieutenant, two sergeants first class, seven sergeants or corporals, one acting cook and forty-four privates, first class, or privates. The duties of the privates are not given in the manual but in the letter of reorganization, approved by the Sec-

retary of War, May 4, 1911, some details are given. A horseshoer, a saddler, a musician, a cook, fifteen drivers, twelve ambulance orderlies, four packers and ten litter bearers are provided for and although these assignments are not included in the manual, the list shows that all of the technical positions have been considered in making up the total of forty-four and arrangements for training and instruction can be made accordingly.

Between battles, the duties of the ambulance company are simple and an elaborate organization is out of place. The company commander does not need an adjutant, a quartermaster and a commissary. The duties to be performed conform to those of a troop of cavalry or a battery of field artillery. Each driver has his team and vehicle. The packers attend to the four mules and packs. There is a guard and an officer of the day. One officer may be given special charge of the detachment, another of camp sanitation. The chief duty in prolonged camps will consist of instruction and drills and all officers should have their part in these. The senior noncommissioned officer will have general charge. Two are with the transportation. There will also be necessity for a sergeant in charge of records, a mess sergeant and a police sergeant. The senior sergeant will probably have charge of medical property papers and the sergeant in charge of transportation will be quartermaster sergeant. Imposing regulations as to detailed duties on the ambulance company will take from it the essential quality of elasticity.

The paper work of a unit as mobile as an ambulance company must be made as simple as possible and in spite of the formidable list of records, returns and reports of the manual, it is so in reality.

Directors of ambulance companies keep only a document file and correspondence book.

TACTICS

Three zones are usually defined in describing the service of evacuation of wounded: the collecting, the evacuating and the distributing. The regimental detachments and the ambulance companies coöperate in the collecting zone.

The ambulance company comes into close contact with the regimental service. During battle, the regimental service gives what aid is possible on the line and forms the wounded into nests. The first-aid station is formed and wounded are dressed and returned to the firing line, sent to the station for slightly wounded, the dressing station, or elsewhere. Under exceptional circumstances severely wounded men may be transported to the dressing station by regimental personnel, but it is only by authority of the regimental surgeon or chief surgeon that members of the detachment go farther back than the first-aid station. Crowding must not be permitted at the first-aid stations and if it is threatened a messenger may be sent by the regimental surgeon to aid the ambulance company in finding the road. The regimental detachment and the ambulance company bearers work together at night fall. Wounded who must be left behind on account of an advance in position of the first-aid station are attended by either the ambulance company or men of the regimental detachment. The ambulance company does not establish its dressing station until the regimental service has reported that overcrowding is imminent. Dressings, immobilization of fractures, ligations, the administration of food and restoratives, and the beginning classification of patients are all functions of the regimental service which help to lighten the work of the ambulance company. After a severe battle, the ambulance company alone will find itself unable to perform all of the collecting in its zone and

aid must come from the line of communications or details from the regiments.

The relations of the ambulance company and field hospitals are close and constant. The commanding officer of a field hospital is required by regulations to maintain communication with the director of ambulance companies. The dressing stations evacuate largely into the field hospitals and, in case of victory, the hospitals may be moved to the dressing station having the greatest number of patients or a hospital may replace a station so that the ambulance company may go forward. On the order of the chief surgeon, slightly wounded may be directed to the field hospitals instead of as usual to the station for slightly wounded, or to the rear. A dressing station will at once feel the absence of the field hospital if, as in an unexpected attack, the hospital arrives late. The field hospital is evacuated by the ambulance company only under unusual conditions and then at the close of the action. Besides the close relationship existing between the field hospitals and ambulance companies on the battlefield, they will usually march and camp together and temporary aid by detachments of personnel from one to the other will doubtless be made under varying conditions by proper authority. During a war the ambulance company will be overworked during times of battle only and in the interim will have an excess of personnel. The field hospital, with an equally large camp area and much greater equipment and possibly cantonment hospital duties too, will frequently require help from the ambulance company. On the other hand while both units are in park during the early stages of an action, if the chief surgeon desires sanitary troops to relieve a special situation at any part of the line, he will probably call on the field hospital as the organization least likely to be needed

promptly for arduous duty, It appears probable and natural that, if the two units are camped together for long periods, the transportation and mounts of the field hospital will be cared for at the picket line of the ambulance company and that the ambulance company will use the more commodious and better equipped office of the field hospital.

The station for slightly wounded is of interest to the ambulance company because it relieves the dressing station of a large group of wounded during battle and because it may be the collecting place for the daily sick before an action.

The personnel of the line of communication may have to be called upon to assist the overwhelmed ambulance company after a severe action. The slightly wounded may be directed by the orders of the chief surgeon to an evacuation or base hospital and they are to be received by the transport column on proper passes from the dressing stations or other parts of the field. In a sudden attack, the line of communications is unprepared and a greater burden will thus be thrown on the dressing stations.

These relations are only a part of those of one unit, the ambulance company. The importance and difficulty of the task of the chief surgeon of a field army in arranging for a proper concert of action for the prompt removal of the wounded to the rear and of medical supplies to the front is therefore apparent.

Although the classification of the wounded begins at the front and ends in home territory, the ambulance company has a lion's share of the work at the dressing station and in advance of it.

Classification prevents undue handling of patients. It tends to economy in transportation and lessens the evil of absenteeism. It is often necessary to classify from several points of view. If the

classification is to form the basis of a report to the home authorities for the information of relatives, the outcome as to life would determine the group; if the wounded man was being considered as a fighting unit, the location of the injury might control; if the kind of vehicle and destination were in question, still other factors might have weight. For instance a man with a shattered right thumb would be classed as slightly wounded if his mother was to receive the report, severely wounded for his captain's purposes and he would be expected to walk to the rear.

On the march if the advance is for the purpose of going into battle, and the action is a planned one, the line of communication will have been evacuated, means of transport will be known and the chief surgeon will have designated the parking place for the ambulance company. The parks may be placed within reach of the probable future scene of activity if the chief surgeon has been able to determine by the orders and the formation of the troops what these are to be; but as a rule even in a deliberate battle wisdom will indicate a waiting policy. It should be remembered that the pack mules can go two and one quarter miles per hour on crowded roads and three and one-half under better conditions and that the whole company, every one riding, can make six, on good roads. The need for the dressing station will not arise until the regimental service is inadequate. The part of the line which will need the most service cannot be foretold. The place for parking is therefore the place farthest forward on the line of march of the troops which is entirely safe from fire. From the park the dressing station party is sent forward to the point designated by the chief surgeon using pack mules or wagon according to the character of the fire. Every advantage is taken of cover during this advance. The commanding officer

etablishes the dressing station selecting the exact spot for its location.

The chief surgeon, in following regulations, has consulted the division commander and placed the dressing station out of range of rifle fire, with protection from artillery fire but as near the first aid stations as practicable. In following the manual, he has not condemned a good location because ambulances cannot reach it without exposure to fire because their work is largely performed after the battle. He has also considered roads, water supply and buildings. He has avoided artillery positions. But in following his own instincts, he has watched the progress of the battle and has determined the areas of greatest casualties and he has put his dressing stations there, at the proper time, making all other considerations secondary.

The director of ambulance companies and the commanding officer, in carrying out the general directions of the chief surgeon have supplemented his efforts by detailed care in selecting the best spot for station. The questions of shelter from fire and the inclement weather, the supply of fuel, of water, accessibility from front and rear, are all considered. Natural routes for the wounded are carefully studied. The station must be as near as possible to the line but out of the way of its fluctuations and away from possible flank attacks. Room to spread out the equipment and group the wounded must be provided.

The time to open the dressing stations cannot be fixed because of the uncertainty of battle. The capacity of the first-aid stations will determine the time of establishment.

Concentration of stations is frequently good policy, efficiently covering the front, with special reference to the areas of greatest casualty and economy of service.

Immediately on reaching the site of the dressing station the bearers are sent out and gain contact with the regimental personnel. The dressing station is the special care of the commanding officer and his small party and he establishes the departments required by the manual.

The services of the Provost Marshal's forces will perhaps be needed to control the movements of skulkers.

Field Service Regulations provide that one surgeon from each regiment may be attached to an ambulance company. The surgical work, however, will be restricted to operations to save life or prepare a patient for transportation. Crowding of dressing stations must be avoided. The vexatious question as to how a wounded man is to be carried is decided usually by the officer at the receiving and forwarding section.

A French observer has said that wounded do not come from the firing line in a steady stream but in floods and cannot therefore be attended just as they arrive. Wounded men instinctively crawl away from the place where they were hit and nests of them are naturally formed. Those who are able to do so will walk to the rear, some to the dressing station, others to field hospitals, others to the village or place which they left to go to battle. Many wounded in the Russo-Japanese War were twice hit in this way. On one occasion Russian ambulances went forward and were surrounded by scores of wounded, Japanese fire was attracted and many of the wounded were killed. A lull in the battle may be caused by a shortage of ammunition, the exhaustion of men, or because the enemy is not visible. If the lull in the fighting is caused by the invisibility of the enemy an attempt to remove the wounded will bring on renewed fighting; nightfall is therefore the best time

to move them. During daylight hours the firing line should be divided into areas so far as possible and each area allotted to groups of bearers. A study of the ground should be made to shorten the length of trips to be made by the litter bearers. The bearers not only carry wounded men to the dressing station but perform the valuable service of directing men to the station for slightly wounded. Roads to all of the units should be plainly marked, using diagnosis tags tied to guidons for writing full directions. Bearers go farther to the front than the regimental aid stations if they are needed there. Timidity as to losses must not permit the wounded to accumulate in excessive numbers at the dressing station. At night ambulances may advance beyond the dressing station but during daytime this will rarely be possible. They should not go beyond the field hospitals unless specifically ordered to do so by the chief surgeon.

Since ambulance company commanders will usually have to determine the method of sheltering the non-transportable wounded it will be well for them to remember that Wagget of the British service has noted that churches are dark, cold and poorly ventilated; that town halls are little better; that recently occupied huts are good for contagious diseases, but usually full of vermin; that stables are obviously bad; that shops and warehouses may be light, airy, clean and easily administered; that school houses are not bad, and that, while hospitals and asylums are good, they will generally be fully occupied by civilian or special army purposes. Large private schools, hotels with grounds, and large country houses are ideal, but not commonly found. Suburban houses of rich citizens would probably offer fifty-bed hospitals of great usefulness because the citizen in building has considered every element of site, convenience, health and drainage. His

parlor and billiard rooms will make wards, the smoking room an office, the dining room a surgical ward. The stores can be readily kept in the wagons in the yards. The personnel would probably live in employes' cottages or rooms. No doubt an operating room with a north light could be found.

TRAINING

Progress is being made in the training of officers in subjects pertaining to field service. Ignorance excused and expected ten years ago is now a cause for shame. The examination requirements compel attention and the text books give an opportunity to all, and the schools to a few, to obtain some knowledge of the subjects. In the larger hospitals and posts valuable work can be done by groups of medical officers. One such group, now officially organized, at the Letterman General Hospital, San Francisco, is doing work according to a program, including problems on the map and terrain. The attendance of officers not required to come has demonstrated wide spread interest. The recent suggestions of Major Munson as to the methods of conducting problems for the sanitary personnel at maneuver camps, if adopted, will be a great improvement on past methods. The literature of the subjects is steadily increasing and will shortly have added to it the manual for the field units. The notebook carried by all officers in the field quickly becomes a pocket manual if it is properly used. By having it of the loose leaf variety and indexed, it will readily contain notes and drawings which are valuable if at hand at the right moment. This is the way to make McPherson's formulae available and to carry the casualty percentages and the numerous details of organization, and other data difficult to remember.

Commissioned officers and all men of the ambulance company need to have knowledge of the system

of communication, and Major Munson has recently suggested that at least four of the men be skilled in visual signaling. Commissioned and noncommissioned officers of ambulance companies also require to know more of rifle and artillery fire and of map and road sketching than is needed by members of the Medical Department otherwise situated. Equitation, driving and packing are now subjects of the routine course in the schools and experience indicates that about 75 per cent of the enlisted men become good riders, about 30 per cent can drive, and about 15 per cent can pack a mule, on graduating, while all have profited by the instruction.

The chief recommendations which I desire to make are:

First—To separate the schools of instruction from the field hospitals and ambulance companies and station the schools at recruit depots.

Second—To revise the supply tables of the field units, studying the needs of the probable number of wounded, doubling or tripling this allowance to make it sure, and then distributing the supplies by some logical system among the units. This will lead to new methods of arranging packages and to great reduction in the amount of supplies.

Third—To put the units on the same definite legal basis as other organizations so that the standing, personnel and supplies may be recognized by all departments and embodied in the proper manuals.

NOTE.—In the preparation of this paper I have necessarily followed closely the Manual and the text books of Majors Munson and Straub, and I acknowledge my indebtedness, not only for ideas, but for words as well.

FIELD SERVICE SCHOOL FOR MEDICAL OFFICERS
Session of 1912

THE FIELD HOSPITAL

By Major W. N. Bispham, Medical Corps

The Field Hospital as at present constituted in our army, is the result of the evolution of centuries, though the changes in the last few years have been revolutionary in character.

From the earliest time the wounded have received some assistance after a battle, but the principle usually followed was, that it was cheaper to obtain more able bodied men, than to attempt to heal the disabled. In most cases the wounded were allowed to remain on the field, until some charitably disposed persons took upon themselves the alleviation of their sufferings. Consequently many men died of neglect, when at the present time they would be succored, and quickly returned to their commands for further service, or invalided home.

The first notice, that I can find of Field Hospitals, is that they were in use at the siege of Miens in 1597, though of course were of more or less permanent nature. From that time until the days of Frederick the Great little change was made. He introduced the so called "Flying Ambulance". This was a fairly mobile Field Hospital, and the idea was further developed by Baron Larry in the Napoleonic wars. The latter, in those preantiseptic days, was a great administrator, but even so, thousands of wounded received no attention.

In our country, during the Revolution, War of 1812 and Mexican War, the aid from the battlefield was far from efficient, and in the first two years of the Civil War, the Medical Department in the field

was in a state of chaos. The establishment of Letterman's ambulance service was the first real attempt to relieve the fighting line of its wounded, and even with that the field hospital or divisional hospital as it was called was a rather immobilized regimental hospital and had no real tactical organization. Later they were made separate organizations, one to a division, but their personnel was either detailed from regiments, or were hired civilians. Practically the same plan was used in the Spanish-American War with the exception, that the personnel belonged to the Hospital Corps. In these two wars the Regimental Hospital attempted to carry out the functions of a mobile Field Hospital, with indifferent success.

After the Spanish-American War our regulations were revised, and a combination of Field Hospital, and Ambulance Company was prescribed. After the Russo-Japanese War this combination was seen not to be feasible for several reasons.

On account of the great improvement in modern fire-arms the danger zone in battles has increased in depth very rapidly, and at present, organizations must be 3,000 yards from the enemy's firing line to be protected from rifle fire. On that account the combined organization was difficult to handle, as it was thoroughly impracticable for the field hospital to advance across this fire swept zone, and still it was necessary for the ambulance section to establish dressing stations nearer the firing line. This would tend toward a dispersion of the administrative unit, which is never wise. In case organization was persisted in, there would also be a tendency for the Commanding Officer of the Field Hospital to retain the ambulance section to assist in the strictly hospital work.

These conclusions led to the adoption of the present plan of separate organizations for the Field Hospitals and Ambulance Companies.

PERSONNEL

The Field Hospital has the following personnel:

Medical Officers: 1 Major, 4 Captains and Lieutenants.

Enlisted men: 3 Sergeants 1st Class, 6 Sergeants and Corporals, and 48 Privates.

With the regulation allowance of four hospitals to a division, that would give, with the Director of Field Hospitals, his orderly, and one extra Sergeant, 21 Commissioned Officers and 230 men.

Comparing the personnel with foreign armies, we see that all the great powers, except England and Austria, have a more liberal allowance, and the latter really has as large number of men, because their transport is driven by civilians.

In addition to this, several modern armies provide for the employment of civilians in field hospitals where practicable. This was most marked in the conduct of the Japanese hospitals in the late war. In my opinion this is impracticable from a standpoint of evacuation efficiency, except that civilians could be employed as drivers, cooks, and ordinary laborers, especially when a Field Hospital is temporarily immobilized. For the interior management, trained men are absolutely necessary, for even with the most liberal personnel now allowed in any army, the highest rate of efficiency is absolutely necessary, to expedite the proper evacuation of the wounded.

The Austrian Army regulations provide that enlisted men of the line, who are unable, on account of slight injuries or other slight disability, to take part in the action with their command, be formed into convalescent companies at the rear. One of their

principal duties is to assist at Field and Line of Communication Hospitals. This permits a further increase of personnel, over the regular hospital cadre, and it is, in my opinion, worthy of imitation in our army.

Cases of this kind, which might include men with slight injuries to the lower extremities, and convalescents from the less disabling diseases, could be used to distribute food to the wounded, and perform the ordinary police of the camp. They may also, if provided with rifles, assist in guarding the premises. In case of an advance of the organization, they would be turned over to the relieving evacuation hospital, or sent to some near-by temporarily immobilized field hospital.

From the foregoing remarks it may be seen, that the rather limited personnel, of these units, impress upon their commanders, the very important work of thoroughly training them in the performance of their duties before actual operations begin.

EQUIPMENT

The allowance of equipment for each field hospital is very liberal, and when measured by European standards seems excessive, but conditions of service in Europe and in America are entirely different. In the former the density of population is such, that there is always a village or town conveniently located for such units, and therefore tentage is practically never used in the zone of operations. With us such conditions do not apply, and in the great majority of cases, the hospital will have to be established under canvas. Even though loaded down with tentage, all supplies, including five days rations and forage, can be very easily packed into the eight wagons allowed, making only a comfortable load for each wagon. Of course, when necessary, a large amount

of additional dressings can be added to the supplies. These are very light and do not add much to the total weight carried. Our supplies are packed very compactly, and differ from most armies in the fact, that our medicines are in tablet form, and therefore much more easily handled.

In some cases, where a rapid movement is contemplated, the roads are bad or there is a temporary shortage of transportation, the total amount of supplies carried can be cut down nearly one half by eliminating all baggage, tentage, stores, bedside tables, microscopical outfit, bath tubs, and other articles not absolutely necessary, thereby eliminating four wagons and facilitating the rapid arrival of the unit upon the field. The stores eliminated would be kept in the rear, to come up when conditions were more favorable.

The Japanese included a complete outfit for the bacteriological examination of water, and in some field hospitals, an X-ray apparatus. These are omitted from our supply table, and I doubt very much their practicability in the field.

The Russian regulations provided for bedsteads, but in actual service it was found that such equipment could not be used, and had to be left in the rear. The principal points governing the selection of equipment and supplies for a field hospital must be their absolute necessity, compactness and lightness. In our service these points were carefully considered when preparing the supply table, and all unnecessary articles were omitted. But coming down to the simplest terms, supplies for a field hospital mean principally dressings, more dressings, and still more dressings.

TRANSPORTATION

The allowance of transportation (8—4—horse wagons in our service) is about the same for all

armies, though Russia has much more than any other. With us the wagons are primarily for transporting equipment, but when empty can be used for wounded.

The evacuation to the field hospitals from the front is conducted by the ambulance companies, and from the hospitals to the rear by the transport columns. In the Austrian army a Red Cross transport column is attached to each field hospital for evacuation to the rear, but this is unnecessary. The Chief Surgeon of the Division is in complete touch with the sanitary situation, and must know where his always limited transportation is most needed, and be able to throw it to that place from some centrally located point some distance in the rear, and should not have to collect his wagons and ambulances from a number of widely separated organizations.

TACTICAL USE

The field hospitals constitute the third line of sanitary assistance on the battlefield, and their principal function is to relieve the dressing stations of their accumulation of wounded, and to provide more thorough treatment to the wounded so relieved.

In our service four such hospitals are provided for each division of roughly 20,000 men. As each has a capacity of 108 beds under normal conditions, or 162 beds when expanded to the limit of the tentage allowed, that gives 432 to 648 beds to the division. When considering a 10% casualty loss for a division, it is seen that this number is very small, and necessitates a thoroughly organized evacuation service to prevent a complete collapse of the sanitary service of the front.

As compared with most foreign services, this capacity is small, Germany, for instance, having 1,200 beds to a division. This, as I have stated

above, is due to the small amount of transportation necessary for such units with continental armies, tentage being omitted. In our service it is not considered practicable to increase this capacity, for every extra wagon needed counts considerably in the general handling of the divisional transportation.

It is also the rule in other armies to have each hospital divisible into two or more parts. That is perfectly correct, if there is only one to a division, such as the Austrian regulations prescribe, but when the units are as small as ours, a further division interferes with the economical management of the transportation available, and would also cause a much greater dispersion of the already limited personnel.

The field hospitals are attached to each division, and are directly under the authority of the Divisional Chief Surgeon, though the Chief Medical Officer of the Army may detach them, if he thinks the emergency demands it. This decentralization of authority worked very well in Manchuria, and, with the present width of fronts of armies in the field, it is very improbable that the Chief Surgeon of the Army could give more than general supervision to the hospitals of the separate division.

ON THE MARCH

On the march, when not in the presence of the enemy, the field hospitals follow the field trains of the division, but when marching in the presence of the enemy they move up and precede the field trains. This latter provision is important, for it allows the sanitary units to be conveniently located before the engagement begins, and prevents delays caused by the blocking of roads by the divisional trains. Every second or third day one of the hospitals of the division is designated to locate a collecting hospital

for the sick of the command. Conveniently located houses are used, if available, and as little as practicable of the equipment of the field hospital is unpacked. When the command advances, the Director of Field Hospitals leaves a sufficient personnel and supplies to insure proper care of the sick until they are taken over by the line of communication service. In a hospital of this character the local civilian population is called upon as far as practicable to furnish personnel and supplies, and, if possible, a sufficient number of local physicians and nurses should be obtained to allow the regular personnel to accompany their units, and leave only an officer in command of the hospital.

The daily evacuation of the sick to these hospitals can be accomplished by using the returning empty supply wagons.

On a retreat, the order of march is the reverse of that ordinarily followed, and the field hospitals would march at the head of the column, or at the head of the trains if they are directed to a parallel road. Of course no organization of such nature should be placed so that they would likely interfere with the movement of troops.

HALTS

At halts which last for several days or longer, one field hospital is usually designated to relieve the sick from the division, but only so much matériel is unpacked as is necessary to be employed in caring for the number of sick received. The same method of using the local resources, mentioned under the head of marches, is applicable here, and the line of communication service should be in close touch, that there should be no delay in relieving any such field hospital temporarily immobilized.

In camps of mobilization the field hospitals are usually not opened, but a stationary or camp hospital

s provided, frequently in buildings erected for the urpose, though the field hospital personnel may be sed in these local hospitals.

The principal duty of commanders of the field ospitals in camp is the drill and instruction of their nits in the work they will be called upon to do when the actual operations begin.

BEFORE BATTLE

In a planned battle, the operation orders issued before the engagement should always specify the place where the field hospitals are to rendezvous immediately after the troops move off to take up their positions. In locating these units, care is taken to place them as far as practicable behind the center of the division and just off the road, by which the whole line can be reached when it is necessary to advance them. This, of course, is an ideal location seldom to be encountered, but this scheme must be followed as closely as possible. They should not be too far forward—about three or four miles from the front, and should be behind any position which would likely be used for a protective stand in case of a retreat. The general location will always be determined by the Chief Surgeon.

When a defensive action is imminent, the Field Hospitals may at times be brought closer and distributed under cover, to those areas where they will be most needed. Frequently, when holding a strong and more or less permanent position, the Chief Surgeon may plan beforehand the handling of these units, and at times may even order one to be opened up before the battle, if it is at all practicable to move the wounded to the rear during the action.

In case of a rencontre they must be held off the road at some convenient point, but no special location can be designated until the attack fully develops

and the probable point of severest fighting be known.

One point must be particularly emphasized, that they must not be located at such a place or in such a way as to interfere with the movement of troops or ammunition supplies from the rear.

The sick present with a command must be turned over to a Field Hospital designated to receive them, and evacuated to the rear immediately, using empty transportation for the purpose. Every sanitary organization must be absolutely cleared on the eve of an engagement.

DURING BATTLE

The Field Hospitals are held in the positions designated before the battle and should be in readiness to advance, when the Chief Surgeon deems it practicable to establish them. In some cases where they are held near the line and just off one of the most traveled roads to the rear, the personnel of one hospital may be ordered to establish a dressing station, to take care of such wounded as should drift by the regularly located dressing stations at the front.

In a case of this kind, when after the battle, the hospitals are ordered forwarded, only enough personnel is left with the wounded not further evacuated, as may be necessary for their care, and they should be sent back as soon as possible.

Though in theory the Field Hospitals are not to be established until after the battle is over, frequently in practice it will be found most convenient to open them where protection is sufficient to allow them to be brought forward. This is always done, if the battle is going favorably, and the line is advancing. In a case of this nature it is the endeavor of the Chief Surgeon to clear the dressing stations, so as to permit them to keep in close touch with the troops. In bringing up a Field Hospital before the

end of the engagement the Director must take advantage of a lull in the firing, particularly so, if part of the road is exposed and in range of the enemy's guns.

While in a state of inactivity, during the battle, some of the personnel may be sent to reinforce the dressing stations already established, but these officers and men will be ordered back to their units when they are opened.

AFTER THE BATTLE

In considering this phase of the movement, I would style a lull in the fighting, when the action in the immediate front of the division has ceased temporarily, as the end of the fight; though the engagement along some part of the line may last for several days longer. It is manifestly detrimental to the handling of the sanitary service of the front, to keep these units out of action until the enemy is in full retreat.

In locating Field Hospitals at this time, several important points must be considered:

1st—They must be placed on that part of the field where the wounded are thickest.

2d—They must have protection from fire, for at any moment the enemy may renew the action, causing such a unit to close and retire to the rear, if it should be in the danger zone.

3d—They must be close to a road which can be used as an evacuation route, for the fact that Field Hospitals are only a station on the line of the evacuation of the wounded, must always be in mind.

4th—They must be as near as practicable to the dressing stations. In fact it would be better to locate them alongside the dressing stations, if there is sufficient shelter from fire to permit this. Any shortening of the distance of evacuation performed

by the divisional units is a great gain in gen efficiency.

5th—They should be located in close proxi to the wood and water; village and farm buildi should be used as much as possible if suitable bu ings are convenient, this unit may be expanded very much greater extent than practicable w canvas is used.

When the situation has cleared to such an ex that Field Hospitals are to be advanced, and ope we should find them waiting just off a road lea to the front and not more than six or seven m back of the line. Frequently, the Director is headquarters where orders are issued, and can h an immediate conference with the Chief Surgeon to the general location of his organizations and plan of evacuation agreed upon. If not, the C Surgeon would write out his instructions and trans them to his subordinate.

In either case, the Director, after giving or to his hospital commanders to advance to the fr will proceed rapidly to the field and designate location of each hospital. In making this select he should always keep in mind the five card points outlined above, and locate in such a way a obtain the greatest amount of efficiency in the c of the wounded and their further evacuation to rear.

must not be split up into sections. They are as small now as their economical administration will permit, and any subdivision of the units will be very detrimental to their efficiency.

The number of field hospitals opened is left to the Chief Surgeon, who may also bring up those not opened and place them near, ready to receive the overflow if required. The one to be opened first should be determined by roster.

After having arrived at the point selected, the commanding officer of a field hospital will have the tents pitched at once, as far as possible following the plan laid down in the drill manual.

While two squads of twelve men and one noncommissioned officer each are pitching the tents, beginning with the wards, another squad should follow them and equip the tents as rapidly as possible.

As soon as the wagons are unloaded, they should be sent off to the nearest farm or other place where forage is obtainable and load up with hay or straw for the bedsacks, which can be filled as soon as they return. In pitching the tents the flies should be left off, as they may be required to be pitched separately later on if there is an overflow of wounded.

While this work is in progress, one surgeon, one sergeant first class and four men organize a receiving section. As each man is brought in, his dressings are examined, readjusted, if necessary, diagnosis tags inspected to see if correct, and new tags are filled out and attached if needed. The register card for each man is filled out by the sergeant at once. The wounded are divided into four categories—slightly, severely, severely needing further attention, and moribund. As soon as the first ward is ready for patients, the commanding officer designates which class is to be accommodated there, and they

by the divisional units is a great gain in general efficiency.

5th—They should be located in close proximity to the wood and water; village and farm buildings should be used as much as possible if suitable buildings are convenient, this unit may be expanded to a very much greater extent than practicable when canvas is used.

When the situation has cleared to such an extent that Field Hospitals are to be advanced, and opened, we should find them waiting just off a road leading to the front and not more than six or seven miles back of the line. Frequently, the Director is at headquarters where orders are issued, and can have an immediate conference with the Chief Surgeon, as to the general location of his organizations and the plan of evacuation agreed upon. If not, the Chief Surgeon would write out his instructions and transmit them to his subordinate.

In either case, the Director, after giving orders to his hospital commanders to advance to the front, will proceed rapidly to the field and designate the location of each hospital. In making this selection, he should always keep in mind the five cardinal points outlined above, and locate in such a way as to obtain the greatest amount of efficiency in the care of the wounded and their further evacuation to the rear.

It is not always advisable to place each hospital at a different point, but two or more may be combined. This is called for especially where large numbers of casualties have occurred in the assault of a strong defensive position. With all this, always bear in mind that the nearer the hospital is to the dressing stations the more efficient is the working of the unit.

One principle in handling these units must always be observed—that is the separate field hospitals

must not be split up into sections. They are as small now as their economical administration will permit, and any subdivision of the units will be very detrimental to their efficiency.

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are moved in immediately. This procedure is repeated until all the wards are erected, and thereafter the wounded are sent when received to the ward designated.

Immediately on arrival, the cooks proceed to prepare large quantities of liquid food, which is supplied to patients as soon as they are assigned to wards. They will also provide more substantial food for the personnel of the hospital.

When the operating tent is pitched, the attendants, one sergeant and several privates, equip it at once, and two of the surgeons start to work immediately. Simple operations, such as ligation of arteries, suturing of large flesh wounds, amputation when necessary to save life, etc., are performed here, but it must be understood that large and difficult operations, and those which require the opening of any of the large serous cavities of the body, should not be attempted. The principal work in this department will be the complete dressing of extensive wounds and splinting of fractures.

The wards are, under ordinary circumstances, three in number, each consisting of six tents, each with an individual capacity of thirty-six patients. Each ward is under charge of a sergeant, who is assisted by as many men as necessary. Two medical officers are on duty in this section. When a patient is received from the receiving or operating section, he is placed in the ward to which he is assigned and is made as comfortable as the circumstances permit. Unless otherwise directed, he will receive some liquid food, and stimulants, if necessary. He will be examined by a medical officer, who, besides readjusting his dressings if necessary, will give any orders he thinks best for his further treatment.

In addition to the regular wards, the tent flies belonging to the hospital may be pitched separately, forming an outside ward, usually for the more slightly wounded. In pitching these, supports of some kind must be improvised, as no poles are furnished for them.

A field hospital, if opened in a village or near farm houses, may be easily enlarged by using the near-by buildings. The equipment can be expanded very materially, especially if mattresses, blankets etc., can be obtained in the houses. Before using these buildings, they should be cleaned out as well as possible and all furniture not necessary should be removed. If these buildings are used for the entire hospital, the same sectional division is to be observed.

After the hospital is opened, the Chief Surgeon is notified and the dressing stations in the vicinity are also notified of its location, so that no delay will be occasioned in getting the wounded to it.

When the transportation is ready to remove the wounded to the rear, the capacity of wagons or ambulances and the class of wounded desired will be communicated to the senior Ward Surgeon, who will designate the men to be sent, and they will be moved directly from the wards to the transportation. The sergeant 1st class who received them will complete their transfer cards and hand them over to whoever is in charge of the train. If there is not sufficient time for this, he will make a list in duplicate of the men's names and retain one for the hospital records, sending the original with the convoy.

The recording of the wounded is very important work, and to my mind would be facilitated if the paper used for the card be of tough linen, but thin and bound together in a book so that carbon copies could be made with a pencil. They would be per-

forated, and the duplicate torn out and used as a transfer card and the original completed and turned in for the sick and wounded report. This would save the necessary copying of cards as required at present.

If any transportation, other than that belonging to the ambulance company is used, some reliable man must be provided with stimulants and restoratives and sent with the train.

One sergeant will have charge of the dispensary, and he also will be the mess and property sergeant for the command. These two offices can well be combined, as the actual dispensing of medicines in the field takes very little time.

In addition to this, the office is also established in the tent with the dispensary. Here all the necessary papers are prepared and records of wounded kept. One sergeant 1st class and one clerk are sufficient personnel for the office.

The police of the hospital should be under the charge of a sergeant, and in this department, civilians, convalescents and others not usable in other sections should be employed This section should be intrusted with the duty of providing wood and water, digging latrines and other strictly unskilled labor.

After unloading, the wagons are held in readiness for the use in evacuation of the wounded, and are placed under the orders of the director of ambulance companies until the time they will be needed for the removal of the field hospital to some other location.

It is proper at this point, to emphasize the fact, that the arrangements noted above would never work smoothly or thoroughly unless the men had been carefully trained beforehand. In the enumeration of the duties of the different sections, everything appears very simple, but unless every man's work

coördinates with his fellows' there is a great loss of time and labor, and the amount of work accomplished is very much less than desired.

After the hospital is established, it is necessary to have a small guard attached, to see that there is no interference by unauthorized persons, and also that malingerers are promptly returned to their commands.

When a field hospital is located a little distance from the road, guide flags or markers must be placed so as to direct the wounded and collecting parties to the hospital. When practicable, an enlisted man is stationed there to divert the stream of slightly wounded away from the hospital.

It is very important to connect the field hospital to headquarters, by telephone as soon as the wire can be laid. This permits the handling of those units without loss of time.

The bodies of all men dying in the hospital must be placed together at a somewhat isolated point, near the hospital, and the officer, detailed to supervise the burial of the dead, notified in regard to their location and number. They will be buried at the place designated by him.

All personal property, such as money, watches, trinkets, etc., found on the dead must be carefully listed in the presence of witnesses and placed in envelopes which will be sealed and turned over to the sergeant in charge of property. After the hospital is cleared these will be sent back to the base, in charge of some responsible person.

All arms and ammunition brought in by the wounded must be turned over to the nearest combat troops.

CLEARING

There can be no special time designated for the clearing of a field hospital, but as soon as transporta-

tion is provided, the wounded must be sent back to the line of communications hospitals.

The number of the evacuated depends first upon the class of wounded in the hospital, and, second, upon the distance to the evacuation hospital or entraining station.

Non-transportable wounded are always retained, and when their number is known, the Chief Surgeon may direct that they all be collected in one hospital, and that temporarily immobilized until an evacuation hospital can relieve it. All other wounded must be sent back as soon as transportation is provided.

When the nearest hospital on the line of communications is more than a day's march to the rear, more care must be used in selecting the wounded to be evacuated at first, and those who only have little chances of complete recovery in a short time will be sent.

Unless ample transportation is provided, the others will be retained until an evacuation hospital comes up close enough to receive the remainder of the wounded. In other words, the greater the distance from the nearest evacuation station, the smaller the number of wounded to be evacuated.

In moving the wounded to the rear, all the available army transportation is used, including wounded transport columns, empty supply wagons, and other vehicles which are to return empty. In addition to these all the civilian transportation in the vicinity is commandeered—usually with impressed civilian drivers.

The ideal method of clearing a field hospital is not by transporting the wounded to the rear, but where possible, the bringing up of an evacuation hospital to take over the field hospital as it stands, thus releasing the personnel to rejoin the command.

This is accomplished by the evacuation hospital bringing up a complete field hospital and transferring it to the field hospital commander, who then has nothing further to do but to turn over his original hospital as it stands to the evacuation hospital personnel, and march off to his division.

In some cases, neither method of clearing is possible, and one hospital with a division is immobilized until it can be relieved of its wounded by the line of communications service. In such a case, all the wounded present in the division will be collected in this one hospital, so as to relieve the other units as far as possible, thus permitting them to be of service in an early engagement.

When a convoy of wounded is sent to the rear, it is very important that the line of communication service be notified of the time of departure and the number and category of wounded contained in it. If this is always done, preparations will be made for their reception, and the transport can quickly return to the front, thus facilitating evacuation.

RESUPPLY

After a field hospital is cleared, the commander makes a complete list of all supplies needed to replenish those used during its service, and this list, after approval by the Chief Surgeon, is turned over to the Divisional Medical Supply Officer for the issue of the stores required. By this time, the depot has been brought forward on the field, and the issue can be made rapidly, and the field hospital, thus resupplied, be in readiness to advance to whatever point the Chief Surgeon deems its services most needed.

FIELD SERVICE SCHOOL FOR MEDICAL OFFICERS
Session of 1912

OUTLINE SCHEME FOR THE SELECTIVE REDUCTION

In the Equipment and Supplies of the Field Hospital, Assuming Progressive Reduction in Its Normal Transport of Eight Wagons by One Wagon, as a Result of Military Necessity, Down to a Point Where Only a Single Wagon Is Available.

By Captain James L. Bevans, Medical Corps.

TO REDUCE TO SEVEN WAGONS

Cut out of load No. 8:

125 pins, tent, large, extra —105
200 pins, tent, small, extra —168
20 Sibley stoves —400
120 stovepipe joints —435
20 thimbles — 10

Transfer these articles:

2 sets tubs, bath 160 lbs. to No. 2
1 pkg. crutches 40 lbs. to No. 6
1 pkg. brooms 20 to No. 7
3 cans oil 120 to No. 7
Add 1 field kit 12 lbs. to No. 1
Subtract ⅛ forage for 3 days for 32 draft animals 108 lbs. from No. 5.

The following loads result:

No. 1—2927
No. 2—2880
No. 3 - 3060
No. 4—2736 } It represents a loss of extra pins and stoves
No. 5—2729
No. 6—3002
No. 7—2332

TO REDUCE TO SIX WAGONS

Cut out the following:

1 hospital tent complete from No. 1	—240 lbs.
2 Darnall filters and powder No. 1	—176 lbs.
12 tables, bedside, folding from No. 4	—120 lbs.
⅛ of forage for 3 days for 32 animals from No. 5	- 108 lbs.
6 boxes hosp. stores from No. 6	- 550 lbs.
4 tent flies, wall, for sinks from No. 7	—152 lbs.

Transfer:

9 boxes surgical dressing	622 lbs. to No. 6
1 box of instruments and apparatus	100 lbs. to No. 2
3 boxes miscellaneous supplies	178 lbs. to No. 4
2 boxes miscellaneous supplies	134 lbs. to No. 4
4 chests commode	160 lbs. to No. 5
1 tool chest	145 lbs. to No. 5
2 buckets, white enamel	18 lbs. to No. 4
27 buckets G. I.	104 lbs. to No. 1
57 surplus kits	399 lbs. to No. 1
1 package brooms	20 lbs. to No. 2
3 cans oil	120 lbs. to No. 5

This change results in the following loads:

No. 1—3038
No. 2—3000
No. 3—3060
No. 4—2946
No. 5 - 3046
No. 6—3002

TO REDUCE TO FIVE WAGONS

Cut out the following:

1 hospital tent, complete	from No. 1—240 lbs.
2 mess chests	from No. 1—338 lbs.
2 boxes stationery	from No. 2—150 lbs.
1 box Medical books	from No. 2 40 lbs.
1 chest acetyline, etc	from No. 2— 55 lbs.
1 chest carbide	from No. 2 -120 lbs.
1 hospital tent complete	from No. 2—240 lbs.
2 hospital tent flies	from No. 2— 70 lbs.
1 set bath tub	from No. 2— 80 lbs.
12 hospital tent flies	from No. 3—420 lbs.
⅛ forage for 3 days for 32 animals	from No. 5—108 lbs.
1 tool chest	from No. 5—145 lbs.
6 boxes hospital stores	from No. 6—557 lbs.
2 boxes lanterns	from No. 6—100 lbs.
6 hospital tent flies	from No. 6—210 lbs.
1 package of crutches	from No. 6— 40 lbs.

Transfer the following:

1 box disinfectants 63 lbs. from No. 6 to No. 4.
3 hospital tents No. 6 to No. 2
2 hospital tents No. 6 to No. 1
1 hospital tent No. 6 to No. 3
3 boxes Surgical dressings, No. 6 to No. 5
2 boxes surgical dressings, No. 6 to No. 1
2 boxes surgical dressings, No. 6 to No. 2
2 boxes surgical dressings, No. 6 to No. 3
Add 1 field kit to No. 1—12 lbs.

TO REDUCE TO FOUR WAGONS

Cut out the following:

126 rations at 3 lbs. each—378 lbs. from No. 1 (leaving 2 days for 57=114).
12 ax helves — 15 lbs. from No. 1
4 pick ax helves — 8 lbs. from No. 1
2 hospital tents —410 lbs. from No. 1
1 typewriter — 60 lbs. from No. 2
1 table, operating — 60 lbs. from No. 2
1 bath tub — 80 lbs. from No. 2
1 package brooms — 20 lbs. from No. 2
3 hospital tents —615 lbs. from No. 2
1 hospital tent —205 lbs. from No. 3
1 box disinfectant — 63 lbs. from No. 4
3 wall tents for officers—249 lbs. from No. 5
14 litters —308 lbs. from No. 5
3 cans oil —120 lbs. from No. 5
108 lbs. forage from No. 5

Transfer the following from No. 5 load:

432 lbs. forage to No. 1
288 lbs. forage to No. 1
216 lbs. forage to No. 3
5 officers field baggage, 600 lbs. to No. 2
6 litters —132 lbs. to No. 2
4 chests commode —160 lbs. to No. 2
2 boxes surgical dressings to No. 1, 207 lbs.
1 box surgical dressings to No. 4, 207 lbs.
Add 1 field kit—12 lbs. to No. 1.

The following loads result:

No. 1—3080 lbs.
No. 2—3055 lbs.
No. 3—2994 lbs.
No. 4—3015 lbs.

TO REDUCE TO THREE WAGONS

Cut out the following:

18 G. I. buckets—78 lbs. from No. 1
516 lbs. forage from No. 1 (leaving 1 day's forage only).
1 box miscellaneous supplies—75 lbs. from No. 2
233 lbs. medicines (estimated) from No. 2
200 lbs. instruments and appliances (estimated) from No. 2
200 lbs. chests, medical, surgical and stores (by consolidating) from No. 2
2 hospital tents from No. 2
1 box instruments and appliances—100 lbs. from No. 2
6 hospital tents—1230 lbs. from No. 3 (6 now left)
144 lbs. forage from No. 3
2 nests buckets, white enamel—18 lbs. from No. 3

Transfer the following from No. 4:

9 tent units	—1188 lbs. to No. 2
9 tent units	—1188 lbs. to No. 3
2 boxes miscellaneous supplies	— 134 lbs. to No. 3
1 box surgical dressings	— 69 lbs. to No. 3

The following loads result:

No. 1—2498 lbs.
No. 2—3025 lbs.
No. 3—3011 lbs.

TO REDUCE TO TWO WAGONS

Cut out the following:

8 axes—32 lbs. from No. 1
2 pickaxes—16 lbs. from No. 1
2 spades—10 lbs. from No. 1
1 bundle guidons, colors -20 lbs. from No. 1
200 picket rope- 80 lbs. from No. 1
6 G. I. buckets—26 lbs. from No. 1
204 lbs. forage from 1 No. (all)
200 lbs. (estimated) medicines from No. 2 (leaving hypo tablets)
100 lbs. instruments and appliances (estimated) from No. 2 (leaving 47 lbs)
1 box microscope—50 lbs. from No. 2
4 litters—88 lbs. from No. 2 (leaving 2)
3 chests commode—160 lbs. from No. 2 (leaving 1)
3 hospital tents (615 lbs.) from No. 3 (leaving 3)
72 lbs. forage from No. 3
9 tent units—1188 lbs. from No. 3

Transfer from No. 3 as follows:

3 hospital tents—615 lbs. to No. 1
2 boxes surgical dressing—138 lbs. to No. 2
2 boxes miscellaneous supplies—134 lbs. to No. 2
1 box surgical dressings—69 lbs. to No. 2

This leaves loads as follows:

No. 1—2737 lbs.
No. 2—2708 lbs.

TO REDUCE TO ONE WAGON

Cut out the following:

1 range, field	—230 lbs.	from No. 1
1 shovel, L. H—	6 lbs.	from No. 1
57 surplus kits	—399 lbs.	from No. 1
3 hosp. tents	—615 lbs.	from No. 1
2 litters	— 44 lbs.	from No. 2
1 chest commode	— 40 lbs.	from No. 2
6 tents	—792 lbs.	from No. 2 (leaving 3)

This leaves in the final wagon:

Driver and equipment	180	5 officers field baggage	600
Box miscellaneous supplies	75	57 field kits	684
Box instruments and appliances	47	114 rations	342
1 field desk	130	1 shovel, L. H.	6
2 boxes surgical dressing	138	1 flag, red cross	5
1 litter	22	1 flag, National	5
3 tent units	396		1642
2 boxes surgical dressing	138		
2 boxes miscellaneous supplies	134		
1 box surgical dressing	69		
2 boxes surgical dressing	139		
2 boxes surgical dressing	138		
	1606	Total Load=3248	

Scheme of Eliminations and Transfers in Tabulated Form

LOAD I		CHANGES						
		1st	2d	3d	4th	5th	6th	7th
Driver and equipment	180							
2 tents, hospital	420		-240	-240				
240 rations	720				-378			
1 range, field	220							0
2 mess chests	338			0				
3 axes	32						0	
12 ax helves	15				0			
2 pick axes	16						0	
4 pickax helves	8				0			
2 shovels, L. H.	12							-6
2 spades	10						0	
1 bundle, (6 ambulance guidons and colors)	20						0	
1 flag, Red Cross	5							
1 flag, National	5						0	
200 ft. picket rope	80							
2 filters, darnall	104		0					
Filter powder	72		0					
49 field kits (12 lbs.)	588							
Total	2915	2927	3088	3021	3080	2498	2787	1487
ADDITIONS								
1 field kit	12	No. 8						
24 buckets, G. I.	102						-	
57 surplus kits	399	No. 7				--78	-26	-399
2 hospital tents without flies	410			from No. 6	0			
1 field kit	12		from No. 7					
1 field kit	12			from No. 6				
2 boxes surgical dressing	180			from No. 6				
1 field kit	12				from No. 5			
Forage for 16 animals for 3 days	432				from No. 5	-324	0	
Forage for 8 mounts for 3 days	288				from No. 5	-192	0	
2 boxes surgical dressing	188				from No. 5			
1 field kit	12					from No. 4		
3 hospital tents	615						from No. 3	0
1 field kit	12						from No. 3	
1 field kit	12							from No. 2

LOAD II		CHANGES						
		1st	2d	8d	4th	5th	6th	7th
Driver and equipment	180							0
Box miscellaneous supplies	75					0		
5 boxes medicines	488					-288	-200	
2 boxes stationary	150			0				
5 boxes instruments, etc.	347					-200	-100	
1 box medical books	40			0				
1 chest acetyline light	55			0				
Chest carbide	120			0				
3 chests, med. surg. and strs.	300					-200	-100	
1 field desk	130							
1 box microscope, etc.	50						0	
1 typewriter	60				0			
1 table, operating	60				0			
8 hospital tents, complete	720			-70				
				-240		-410		
Total	2720	2880	3000	2998	3055	3025	2708	0
ADDITIONS								
2 sets tubs, bath	160	from No. 8		-80	0			
1 box inst. and appliances	100		from No. 7				0	
1 package brooms	20		from No. 8		0			
3 hospital tents without flies	615			from No. 6	0			
2 boxes surgical dressing	138			from No. 6				
5 officers field baggage	600				from No. 5			
6 litters	132				from No. 5		-88	-22
4 chests, commode	160				from No. 5		-120	0
9 tent units	1188				from No. 4			-792
2 boxes surgical dressing	138						from No. 3	
2 boxes miscellaneous supplies	184						from	
1 box surgical dressing	69						No. 3	

LOAD III		CHANGES					
		1st	2d	8d	4th	5th	6th
1 driver and equipment	180						0
12 hospital tents	2880			-420		-1230	No. 1 -615
Total	3060	3060	3060	2988	2994	3011	0
ADDITIONS							
1 hospital tent without fly	205			from No. 6	0		
2 boxes surgical dressing	138			from No. 6			No. 2
Forage for 6 mounts for 8 days	216				from No. 5	-144	0
9 tent units	1188					from No. 4	0
2 boxes miscellaneous supplies	184					from No. 4	No. 2
1 box surgical dressings	69					from No. 4	No. 2

LOAD IV		CHANGES 1st	2d	3d	4th	5th
1 driver and equipment	180					0
18 tent units, bedding	2376					9 to No. 2 9 to No. 3
18 tables, b. s. folding	180		-120	0		
Total	2736	2736	2946	3009	3015	0
ADDITIONS						
3 boxes miscellaneous supplies	178		No. 7		0	
2 boxes miscellaneous supplies	134		No. 7			No. 3
2 buckets, white enamel	18		No. 7			0
1 box disinfectant	68			from No. 6	0	
1 box surgical dressings	69				from No. 5	No. 3

LOAD V		CHANGES 1st	2d	3d	4th
1 driver and equipment	180				0
32 animals, 3 days forage	864	756	648	540	432 to No. 1
8 mounts, 3 days forage	288				No. 1
6 mounts, officers, 3 days	216				No. 3
3 tents, wall, officers	249				0
5 officers field baggage	600				No. 2
20 litters	440				132 to No. 2 (6 litters to No. 2) -308
Total	2837	2729	3046	3000	0
ADDITIONS					
4 chests commode	160		No. 7		No. 2
1 tool chest	145		No. 7	0	
3 cans oil	120		No. 7		0
3 boxes surgical dressings	207		from No. 6		2 to No. 1 1 to No. 4

LOAD VI		CHANGES 1st	2d	3d
1 driver and equipment	180			0
12 boxes hospital stores	1107		-550	0
1 box disinfectant	68			No. 4
2 boxes lanterns	100			0
6 tents, hospital	1440			3 to No. 2 2 to No. 1 1 to No. 3 -210
Total	2890	2890	3002	0
ADDITION				
1 package crutches	40	from No. 8		0
9 boxes surgical dressings	622		from No. 7	3 to No. 5 2 to No. 1 2 to No. 2 2 to No. 3

LOAD VII		CHANGES 1st	2d
1 driver and equipment	180		0
9 boxes surgical dressing	822		to No. 6
1 box instruments and appliances	100		No. 2
3 boxes miscellaneous supplies	178		No. 4
2 boxes miscellaneous supplies	134		No. 4
4 chests, commode	160		No. 5
1 chest, tool	145		No. 5
2 buckets, white enamel	18		No. 4
27 buckets, G. I.	104		No. 1
57 surplus kits	399		No. 1
4 tent flies, wall, for sinks	152		0
Total	2192	2332	0
ADDITIONS			
1 package brooms	20	from No. 8	No. 2
3 cans oil	120	No. 8	to No. 5

LOAD VIII		CHANGES 1st
1 driver and equipment	180	0
2 sets tubs, bath	160	No. 2
1 package crutches	40	No. 6
1 package brooms	20	No. 7
3 cans oil, illuminating	120	No. 7
125 pins, tent, large	105	0
200 pins, tent, small	168	0
20 Sibley stoves	400	0
120 joints, stove pipe	435	0
20 thimbles, stove pipe	10	0
Total	1638	0

FIELD SERVICE SCHOOL FOR MEDICAL OFFICERS
Session of 1912

THE SANITARY SERVICE WITH INDEPENDENT CAVALRY

By Major E. A. Dean, Medical Corps, U. S. A.

The characteristic of cavalry having the most important bearing on the sanitary service is its great mobility. The mounted man can cover in a given time three or four times as great a distance as the infantry soldier. The cost of maintenance of cavalry is, however, much more, and this tends to place a limit on the proportion of cavalry used in war. The difficulties of supply also have a similar influence. While it may be true that cavalry can fight anywhere except at sea, the considerations mentioned confine the employment of cavalry largely to duties connected with the service of security and information. It is "the eyes and ears of the army." To discharge properly its function, it must travel far and rapidly, must cover great stretches of territory, must disperse into small detachments or concentrate into brigades or divisions, and must be prepared to fight either in small or large bodies. Just in proportion to the degree of dispersion, the rapidity of movement and the amount of fighting do the duties of the sanitary contingent increase in difficulty.

Cavalry service may be considered as falling under two main divisions. First, divisional or protective cavalry consisting of small cavalry units attached to divisions or smaller organizations and

usually operating at no great distance from other troops in the conduct of a limited reconnaissance. Second, independent or strategic cavalry, operating under the orders of a commander of a field army or an army. Such a body forms the strategic advance guard of the army to which it is attached. It operates at a great distance from it—from ten to fifty miles, depending upon the terrain, the character of the opposing cavalry, and so on.

To quote from the Field Service Regulations: "Reconnaissance to find the enemy is usually made by cavalry varying in strength according to the situation, but in large commands appearing generally as *independent* brigades or divisions. On such duty cavalry not only gathers information, but also screens the main command by keeping the enemy at a distance.

"Independent cavalry is that cavalry which, operating under the direction of the commander of an army or separate command, is detached on some special mission. * * * Independent cavalry on reconnoitering duty pushes boldly out in advance, usually one or two marches. Its first duty is to find the enemy's main body, and then to preserve contact.

The formation taken by screening cavalry resembles, in a general way, that of other covering detachments. It must cover a wide front with small groups in order to obtain information and prevent detachments of the enemy from getting through or around the screen to observe the main army which it is protecting. It must have sufficient strength in rear to defeat the efforts of the enemy to break through.

The arrangement of the groups composing the screen will differ according to varying conditions. The character of the country and the number and

direction of the roads have a large influence. For a brigade probably the more usual formation will be a division into two nearly equal parts moving abreast on parallel roads five or six miles apart. Each column will move with a main body or reserve preceded by a support and followed by a small rear guard. The support will throw forward several miles to the front a number of patrols which will cover the country between and to the outer sides of the roads. A cavalry brigade acting as a screen will ordinarily have a front of about ten or twelve miles. The distance from the line of patrols to the rearmost detachments will be as much or more.

When the country is such as to permit of freer movement, the formation described by some authorities may be used. Two squadrons in line of troops called contact troops at intervals of one or two miles send forward patrols, one or more from each troop, several miles to the front. Two or three miles to the rear of each group of four contact troops is placed an intermediate squadron and the same distance in the rear of the latter a second squadron as support. Still further back and centrally situated with reference to the front of the formation is the main body of about a regiment with the horse artillery. Each group covers itself with small patrols.

The description of the cavalry screen in the foregoing corresponds in the main to that found in Colonel Wagner's work, "The Service of Security and Information," and probably will not be satisfactory to the modern cavalryman. However, it serves the purpose so far as any investigations into the nature of the sanitary service with cavalry are concerned.

A cavalry screen such as has been described above keeps in touch with the army in the rear and with similar bodies that may be on either flank. An

army advances along a certain line of operations marked, as a rule, by a railroad or highway or system of parallel roads. Therefore the screen or strategic advance guard will follow in a general way the same railroad or road-system. Through the latter it will keep in communication with its base, receives supplies and evacuate non-effectives.

Towards the front the patrols will be in contact with similar patrols of the enemy striving to push them back or to break through and get behind them in order to get information of the larger groups in the rear. There will result many small cavalry encounters and occasional casualties. Such casualties will occur in widely scattered localities and at times in isolated or inaccessible places.

After some time spent in driving in the smaller parties the cavalry of either side will concentrate with the purpose of striking at and defeating the opposing cavalry, as only in this way can information of the enemy's main army be obtained. Various minor skirmishes may then culminate in a cavalry battle in which horse artillery will probably participate and in which cavalry charges and dismounted small arms fire will figure. The percentage of casualties may be large, comparing with that of engagements in which all arms take part.

From the foregoing it appears that the wounded in cavalry service will vary between the wide extremes of the few casualties of reconnoitering or strategic patrols scattered over many miles of any sort of country to the large number occurring in cavalry battles within quite narrow limits of time and space.

The cavalry arm will, of course, be used in general engagements, usually on the flanks of the main battle line, and in pursuit or retreat. In the first case there is no special difficulty to be considered, as

it will be easy to connect up with the units of the main command, while in pursuit or retreat the conditions, in so far as they effect the sanitary problem, will differ little from those of screening duty.

The sanitary personnel and equipment in our service remains practically the same as that provided for infantry. The Field Service Regulations allow the cavalry regiment the same four medical officers, twenty-four enlisted men of the Hospital Corps, pack mule, field wagon and regimental infirmary outfit as are assigned to infantry. Twenty-two of the enlisted men are mounted. Colonel Hathaway of the British Army remarks that only the United States makes provision in regulations for mounting the sanitary personnel.

The cavalry division is allowed by Regulations two ambulance companies and two field hospitals instead of the four of each of the corresponding infantry command. The reserve supplies of the infantry and cavalry division appear to be the same. Doubtless efforts at adaptation would be made in active service.

Presumably, independent brigades will have a field hospital and ambulance company or sections of the same assigned to them.

The difficulties of transportation are greatly augmented in cavalry service and it may be well to consider in some detail the resources at our disposal.

The only litter now in use is the common service litter which is not very well adapted to carriage on horses or mules. Several attempts have been made in our service and in other services to devise folding litters, horse litters and so on. No doubt a folding litter sufficiently strong and rigid would be a desirable addition to the field equipment of sanitary personnel serving with cavalry. It could easily be packed on horses or mules and thus gotten to places

where most needed. It is understood that a folding litter weighing about twenty-seven pounds is to be adopted in the United States Army.

Various models of horse litters for one or two animals have been tried at one time or another in different services. Some of these carry a single patient longitudinally over the animal's back; others carry one patient on each side in the manner of a side pack. Some are attached to the ordinary cavalry saddle, some to the aparejo, and others require special apparatus. The Army Manual of Pack Transportation illustrates and describes several forms (see page 201 and following of that Manual). The single top pack form does not give from examination any conviction of its security. The two-patient side pack model appears better, but has the disadvantage of the inability to carry a single patient unless counterbalanced with a suitable weight. The Japanese in their Manchurian campaign employed something on the order of the last mentioned model. This is illustrated on page 290 of Major Lynch's report (Report of Military Observers Attached to the Armies in Manchuria During the Russo-Japanese War, Part Four. Report of Major Charles Lynch, Medical Corps, U. S. Army, General Staff). The litters are carried by two curved transverse supports which are attached to the cantle and the pommel of the saddle. These supports appear to be made in two pieces for convenience in packing when not in use. Surgeon Ito of the Japanese Army states that it is necessary for the equipment of independent cavalry not provided with vehicles. Its advantages as given are that it can be used without special saddle, and that few bearers are needed. On the other hand it is inconvenient with single patients; as already stated, it is heavy for a single animal and trouble arises on steep, rough or muddy roads. It

does not appear from Major Lynch's report that it was very extensively used.

Mule chairs or cacolets have been used in the past. All are probably familiar with their appearance and the method of using them. Their importance hardly warrants extended description.

To enable some of the more severely wounded to keep in their saddles, thus facilitating their removal to the rear, various supports have been devised and recommended by their inventors. A saddle crutch has been described recently by Colonel Hathaway of the British Army in the Journal of the Royal Army Medical Corps. It is intended to be carried by a certain proportion of cavalry soldiers and is to be attached to the saddle when needed. It is as yet experimental and adds still more weight to an already heavy equipment. However, it is regarded by some as a valuable appliance. It is adapted to use with a moderately severe class of cases which, while unable to keep their seats without some support, are not sufficiently serious as to render wheel transportation necessary.

Each ambulance company formerly had as a part of its equipment four travois. It appears that these have been eliminated, as they are not mentioned in the last Manual for the Medical Department. This is just as well so, since a considerable weight is gotten rid of and a better travois can be improvised.

In the matter of wheel transportation intended for the use of the sick and wounded, our service has, so far, the regulation four mule ambulance, a good enough vehicle, no doubt, for many purposes. However, it weighs as much as the army wagon. There has been some experimentation with a light two-wheeled one-horse vehicle styled a galloping ambulance. In the British service the transport or bearer division of the cavalry field ambulance, correspond-

tirely out of the question. The travois was employed with great success and bodies were brougth in on them from places where horses were taken with difficulty. Its construction is only a matter of a few minutes' work and the necessary material is always at hand. Two light poles of sufficient length, fourteen to sixteen feet, are cut and their large ends notched. They are then attached to the saddle by means of the stirrup leathers, and, if necessary, a surcingle is used as a breast strap. A cross piece is lashed to the poles just behind the horse so as to maintain the proper distance between them. If the service litter is available, it may be attached by means of the slings. A second cross piece is thrust through the rear stirrups of the litter and rests on the poles. If of proper size it jams in the stirrups and is secured against working out to either side. If no litter is to be had, one will have to be improvised. A blanket serves admirably.

The sanitary personnel—how shall it be distributed with the various groups forming the cavalry screen?

The ordinary small patrols can hardly expect to have either medical officers or Hospital Corps men sent out with them. Some of the more important patrols, however, have a greater number of men, are frequently commanded by officers and venture a much greater distance from the supporting troops and into more dangerous localities. There might be some show of reason in detailing Corps men or medical officers to accompany them. Assignments of personnel may also be made to the troops or squadrons furnishing the patrols. A Corps man may be allowed to each of four contact troops and a medical officer to the squadron. Similarly, each squadron group in the rear may have its proper quota. The latter can take care of any chance casualties which

making is far behind that of Europe it is probable that the use of motor trucks and ambulances will be even more limited. As a general thing our roads are not only very bad but streams are plentiful and bridges few. This last condition is more of an obstacle if anything than bad roads. A number of a new model of motor ambulance have been purchased recently by the Medical Department, for experiment, presumably. The impression these vehicles gives one is not favorable. They are extremely heavy, have very low clearance, provide for only four recumbent patients and are not of a well known standard make. It seems doubtful that they will prove a success. A reliable automobile ambulance will be a most valuable addition to the equipment of sanitary troops serving with cavalry.

After all, however, we will have to rely only too frequently on improvised expedients. Sometimes impressed vehicles of resident civilians of the particular localiiy in which the need arises will have to be used. The trooper's horse and saddle may be so prepared as to be capable of carrying a recumbent patient. Colonel McPherson of the British Army recommends that the saddle be so built out on each side by lashing on light bulky articles, such as bags of straw, hay and so on as to form a suitable support. Upon this the litter or a substitute for one is placed transversely and securely tied. The officer mentioned claims to have demonstrated to his entire satisfaction the efficacy of this method.

The travois is probably one of the most generally useful and easily constructed devices. Most medical officers are familiar with it. I spent some time in the mountains of Idaho during the forest fires of 1910. In the vicinity of Avery, an extremely rough, mountainous district, it was necessary to collect upwards of fifty dead. The use of wheel transportation was en-

[illegible] Patients should be moved [illegible] In the first instance a [illegible] application of dressings is [illegible] and in the last the ability to correctly [illegible] and general condition of the patient [illegible] medical personnel in the [illegible] service is proficiency in first [illegible] as in the cavalry. It is, no [illegible] that men and officers of the [illegible] a sterile occlusive dressing [illegible] temporary dressings [illegible] and to give an intelligent [illegible] and location of a wound [illegible] patient. While this [illegible] striven for, we are hardly [illegible] Those of us who have observed the results of Hospital Corps instruction must be pardoned for not being very optomistic as to the success of any instruction given. There is reason to believe that men and officers of the line take no very great interest in a matter which they regard as a duty of the Medical Department and only an unimportant side issue so far as they themselves are concerned.

Reports of cases requiring aid and transportation from the rear should indicate, of course, the location of the patients, who should be moved to points near the roads where they may be more easily found. Colonel McPherson states that it is customary in South Africa to mark such places with flags. As already mentioned, we have no light vehicles for picking up these cases. In the British service the light ambulance wagons of the field ambulance are distributed to the regimental units and used for the purpose.

What disposition is to be made of the few cases picked up by the regimental personnel during the period of reconnaissance?

Usually they will have to be passed back to the second line of assistance, the ambulance company and field hospital. For this purpose it must be known just where the stations established by ambulance company or field hospital can be found. Either of these may open stations along the line of advance, notifying the combattant organizations at the front of the situation and of the time they are to remain in operation. If practicable, as soon as the station closes the next in advance should be open to receive patients. At any particular time some one station should be in readiness. The authorities in the rear must be kept informed of the location of these collecting points. Any available transportation should be utilized to evacuate them. Impressed wagons or empty supply wagons, if obtainable, may be used. If the line of advance is along a railroad, the problem may be simplified by employing cars. Automobile ambulances would be useful.

Conditions change when a battle is imminent and the screen concentrates. Any transportation belonging to the ambulance company is now withdrawn to the rear. The regimental detachments take care of the wounded in the early stages of the engagement. It is generally agreed that nothing is to be gained by sending sanitary personnel into cavalry charges. They can only be withheld until the meleé terminates and in case the enemy is driven off the field measures may be taken to clear it of wounded. In case of defeat, a few men with the necessary supplies are left behind with any abandoned wounded. The sanitary service with cavalry troops fighting dismounted will differ little from that of infantry.

After a victory the regimental detachments will be able to accompany their commands in pursuit or in other movements while the personnel of the ambu-

lance companies and field hospitals are left in charge of clearing the field and preparation of the wounded for transportation to the institutions further in the rear.

It is believed that most of the problems of cavalry sanitary service will be met with while on screening duty. However, cavalry raids will present their own peculiar situations and unusual difficulties. In such expeditions, large bodies of cavalry, from a thousand or less up to a division or more, may be employed. The last number was exceeded in some of the great raids of our Civil War. Transportation is cut to the minimum, pack transportation frequently being the sole reliance. Movements are often extremely rapid, both men and animals being pushed to the limit of endurance. Operations are often at great distances from friendly troops in hostile territory and often cut off from any line of communications. Even men in good health and picked physically may find it no easy matter to keep in the saddle. On the other hand, the intention is usually to avoid fighting to the extent fufillment of mission will permit and wide dispersion is uncommon. Raids in hostile territory are as a rule failures and will probably occur even less frequently in the future than in the past. Frequently under these unfavorable circumstances the sick and wounded must of necessity be abandoned and left behind. An expedition which depends for its success on celerity of movement cannot risk failure and even jeopardize its own safety by encumbering itself with non-effectives. Medical officers will, of course, give such assistance as time allows and take advantage of every opportunity to send patients to places of safety.

Finally, it may be stated that the medical service of a large cavalry command must work as a unit to get the best results. Prompt transmission of in-

formation only can secure proper coördination. The various sanitary groups must keep in touch with each other and the chief medical officer must be in communication with the authorities in the rear. The difficulties of transmitting information will probably be greater than elsewhere in active service.

FIELD SERVICE SCHOOL FOR MEDICAL OFFICERS
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The Line of Communications, Organization, Personnel, Matériel, Function and Administration

By Major R. U. Patterson, Medical Corps, U. S. A.

Such is the title of the subject assigned to me by the Director of this School, to bring to your attention this afternoon for our mutual consideration and discussion. It is a subject upon which, compared with other departments of field organization, little has been written, and, from lack of experience in our generation, about which comparatively little is known. I arrived at this conclusion after reading all the available literature I had at hand, and therefore decided that the purpose of the Director in assigning the different subjects to the members of this class was to bring out some of our own ideas, and then, in the discussion to follow, any sins of omission or commission would have attention called to them and valuable points be brought out by the Director and our fellow student officers. Believing this, I have not attempted to approach the subject from the standpoint of historical literature, but have endeavored to place before you my idea of the uses that should be made of the organizations on the Line of Communications now authorized for our Army.

This leads one to consider the following points:

1. What is the Line of Communications?

2. What Medical Department organizations are authorized for a Line of Communications?

Paragraph 12, F. S. R., states that each field army, or important expeditionary force, about to

take the field, has a base selected, with a Line of Communications extending from it to the troops at the front. The whole force, including troops, Line of Communications and base, is under the command of the commander of the field army, or expeditionary force. Furthermore, the Line of Communications includes the base, where supply depots and hospitals are maintained, and also the supply and issue depots at the front. Even when two or more field armies unite to form an army, each field army maintains its own Line of Communications. The Line of Communications may be divided up into districts, whenever necessary for convenience of administration or defense. As the Line of Communications is advanced or lengthened, intermediate bases and depots may be established.

Under Paragraph 16, F. S. R., the commanding officer of the Line of Communications has on his staff a chief surgeon, whose functions are laid down in Paragraph 686, M. M. D. By further consulting the F. S. R., we find that some of the many important duties, entrusted to the Medical Department, are:

(a) To care for the sick and wounded on the march, in camp, on the battlefield, and after removal therefrom.

(b) The *methodical* disposition of the sick and wounded, so as to insure the retention of the effective at the front, and relieve the fighting force of the non-effective.

(c) The transportation of the sick and wounded.

In order to accomplish this, sanitary organizations have been authorized, the work of which falls naturally into three zones:

First.—That done by Medical Department formations with the mobile troops actually at the front, or, in other words, a "collecting zone."

Second.—Those whose duty it is to care for the sick and wounded collected at the front, leaving the sanitary units at that point free to continue their proper functions. Patients who will not soon be able to rejoin the colors are passed along through the lines and base to be treated elsewhere. This is therefore the "evacuating zone."

Third.—The "distributing zone," where those permanently disabled, or who will require months to recover, are distributed to stationary, general, or other hospitals in the home land, or remote from the base.

So that, strictly speaking, the Line of Communications, from a sanitary viewpoint, extends from the immediate rear of the fighting troops at the front to and including the base. In order that this work may proceed in an orderly manner, there must necessarily be a directing head, and F. S. R. provide the commander of the Line of Communications with such an officer in the person of a chief surgeon. Some of the duties of the chief surgeon of the Line of Communications are:

1. The transportation of patients from the field hospitals to the evacuation, base, and other hospitals along the Line of Communications.

2. To keep in touch with medical organizations at the front and relieve them promptly of sick and wounded left behind.

3. To supervise the care and treatment of patients while on the Line of Communications.

4. Segregation of those suffering from contagious diseases.

5. Organization of sanitary squads, casual camps, transport columns, etc.

6. To see that supply depots have at all times what is necessary for those on the Line of Communications, and at the front.

7. To approve requisitions, and see that issues are made, and supplies delivered promptly.

These duties require constant communication with the Chief Surgeons of the Field Army, and of the Divisions the Line of Communications is serving, and also with the authorities in the Distributing Zone. It presupposes good team play by those responsible in each zone, in order to accomplish the best results.

The position of the chief surgeon of the Line of Communications is therefore one of grave responsibility, and should be filled by a man of wide experience, sound judgment, and of unflagging energy. To accomplish his portion of the work, the chief surgeon of the Line of Communications has placed at his disposal medical officers as assistants, and the following Medical Department organizations authorized by F.S.R., and M.M.D.

For each division of the Field Army served by the Line of Communications:

1 Transport column
2 Evacuation hospitals
1 Base hospital
1 Medical Supply Depot

Hospital trains and ships, Red Cross columns, etc., may be used when necessary. Contagious Disease Hospitals, Receiving Hospitals, Rest Stations, and Convalescent Camps, should be established as required.

For the following organizations the personnel and transportation has been laid down: Transport columns, evacuation hospitals, base hospitals, base medical supply depots, hospital ships, and hospital trains. For the remainder of the organizations aforementioned nothing has been assigned. Of all these organizations, only two—the base hospital and

the evacuation hospital—have been assigned supplies on the official supply table. The Reserve Medical Supply, which is mentioned there, belongs to the Divisonal or mobile sanitary units, and not to the Line of Communications. It is therefore evident, that not until an actual state of war exists will the necessity for the use of these organizations arise, and anything definite be determined as to the specific number of officers, men, nurses, supplies, and other impedimenta that will be required by each individual organization now authorized on the Line of Communications. Thus again is the conviction forced upon us, that the Chief Surgeon of the Line of Communications should be a man of wide experience, and capable of making quick and accurate decisions. In the matter of personnel and supplies, he will undoubtedly be largely guided by what the officers, whom he has placed in charge of each unit, state is necessary. Under war conditions he will not always be able to pick and choose his unit commanders, as experienced men will be in great demand, and he will therefore be forced to make the best of whatever personnel is assigned to him.

It is well known that our present Medical Department (officers and men) is totally inadequate numerically, to handle more than two or three divisions, and in the event of war, the sanitary troops will look to our confres in the National Guard, with their enlisted personnel, for reinforcement. From a recent decision of the Attorney General of the United States, it appears that we will be unable to depend upon them for service outside of the United States. Even *with* their aid, it will undoubtedly be necessary to raise U. S. volunteers, including their proper quota of sanitary organizations. Naturally the service of the front will be the primary need to meet, and it will receive enough to

make up its full quota from the sources indicated. What is left over, is practically all that the Line of Communications, and the general hospitals in the Distributing Zone, will receive, with perhaps a few officers and men of the regular establishment detailed to hold the more important executive and administrative positions in those districts. The number, I feel sure, will be totally inadequate. What then will be the solution of the difficulties incident to such a paucity in personnel?

Our country, fortunately, already has a well-organized Red Cross Society. Undoubtedly individual citizens, doctors and nurses, both male and female, funds, matériel, and supplies of all kinds, will be offered by the patriotic citizens of our country. Skilled physicians and surgeons, now on the inactive list of our Medical Reserve Corps, will come forward. Many retired, and former medical officers, will be willing and able to serve in the Distributing Zone back of the base. There is little doubt in my mind, that by using our Reserve Corps officers, volunteer aid societies, volunteer nurses associations, etc., our general hospitals and others in the Distributing Zone will be well taken care of, and that many of these will be available as far forward as the Line of Communication. All Relief work by Presidential proclamation, must be through Red Cross Society, except actual military ones. It is then, by the use of our Medical Reserve Corps officers, ex-contract surgeons, U. S. Volunteer medical officers, volunteer civilian physicians, and other Red Cross surgeons of both sexes, that I believe the situation on the Line of Communications will be met, and let us hope efficiently handled.

In doing this I think it might be stated as a medico-military axiom that "On the Line of Communications, the nearer we approach to the fighting

forces, the *more* trained officers and men should be used in the sanitary units, and conversely, the farther we get from the front the more we should utilize the services of volunteers, and other aid societies, both public and private".

I will now take up each organization likely to be used on a Line of Communications, discuss briefly its personnel, transportation and supplies, and then try to show the relation these organizations bear the one to the other, in a suppositious case.

THE TRANSPORT COLUMN

As already stated, transport columns are authorized at the rate of one for each division served by the Line of Communications. There is nothing, however, to prohibit the Chief Surgeon of the Line of Communications from organizing others if conditions require it, or from augmenting the size of the present one by any available means, under similar circumstances. By the provisions of paragraph 585, M. M. D., a Transport Column consists of 1 Major, and 3 subaltern officers, 20 non-commissioned officers, 4 cooks, and 60 privates and privates first class, or a total of 4 officers and 84 enlisted men. The equipment is exactly that of an Ambulance company, except that there are no pack mules, and therefore one should expect them to accomplish about what an Ambulance Company is able to, in the way of bearer work and transportation. The large number of men, over and above the drivers, is allotted in order that there may be sufficient men to handle the wounded into, and out of the ambulances, and still be able to supply 2 or 3 rest station parties. The allowance of 4 cooks is a wise provision, as there should certainly be a cook left at each Rest Station, without leaving the organization proper, unprovided for in the culinary department.

The functions of transport columns are:

1. **To evacuate patients from Field Hospitals to hospitals on the Line of Communications.**

2. **When troops are marching, to collect and evacuate patients from Field Hospitals to the rear.**

3. **In emergencies to assist in the evacuation of any hospital, or place for care of the sick, on the Line of Communications itself.**

Ordinarily transport columns will keep well in touch with the mobile troops, plying between them i. e. Field Hospitals, and the advance base, or nearest Evacuation Hospital. It is not usually their function to transport patients from Evacuation Hospitals, further towards the base. After receiving patients, they have to assume full charge and care of them until delivered to some other sanitary organization on the line, usually an Evacuation Hospital.

Often the transport column may have to cover considerable distances. Soldiers who are wounded, will be unable to endure more than a few hours of such rough travel, and hence it is desirable to have points where rests can be made, or regular night halting places. These are called Rest Stations, and the wounded are removed from the ambulances and fed and sheltered, enabling them to continue the journey in a few hours or days. It is almost certain that such regular night halting places will be established, at which trains of wounded will stop over. Undoubtedly many of the transport patients would become worse as a result of the travel, or they would develop some complication, which would render a few days absolute quiet imperative. For these reasons, it is probable that many Rest Stations would be fairly permanent. The personnel in any case would come from the transport column. Using part of the Dressing Station equipment the column

has, Rest Station parties could do what was required. The supply table should be revised to give transport columns cooking and messing facilities, and enough detached service or other suitable chests to equip at least 3 Rest Station parties for each column. These things need not necessarily be carried, but be authorized, and kept in the Advance Medical Supply Depot for issue on demand. Imperative emergency operations, readjustment of, or application of fresh dressings, shelter, and nourishment, are the indications. Available buildings should always be used. Where there are none, tentage would be required. As the present allowance of canvas for the dressing station of ambulance companies, and therefore transport columns, is inadequate, it is hoped that this will be increased, so that under such circumstances enough would be available. Of course, with any permanent rest stations lack of shelter would soon be remedied by forwarding from the base the necessary tentage, or materials for erecting shelter pavilions. Just what personnel would be required can only be determined when the conditions have actually to be met, but it is certain that at least the following would form the nucleus, 1 medical officer, 2 noncommissioned officers, 1 cook, and about 7 men to act as nurses, kitchen police, attendants and bearers for a night's stop. When it was seen that any particular rest station was permanently needed—additional surgeons, cooks, and attendants, would be assigned by the chief surgeon of the line of communications from Red Cross or other private aid associations.

If 3 or 4 rest station parties are detached from transport columns, they must necessarily be small, or the column would lose its efficiency by reducing its number below that required to carry on its principal function. While it would hardly be necessary when

transporting wounded by river steamers, it might well be that those shipped by rail over great distances, would need to be given 1 or 2 days rest enroute. On communication lines of such length that railroad rest stations were required, the personnel would be furnished from the sanitary casual detachment at the base, or from aid societies, with a nucleus of regular sanitary soldiers under a medical officer. Most certainly they should not be furnished from the transport column, which should only be called on for such details, between the rail head and the mobile troops, except in great emergency.

EVACUATION HOSPITALS

For information regarding these see par. 586, M. M. D. Two only, are authorized for a division, but if more are needed their organization will be accomplished up to the number required. The personnel consists of a lieutenant colonel commanding, and 13 subaltern officers, 8 sergeants first class, 16 sergeants or corporals, 10 acting cooks, and 119 privates or privates first class, 3 ambulances and 2 wagons are allotted for the moving of patients, and hauling of supplies in its vicinity. There is practically no transportation assigned to be used in moving evacuation hospitals. This is well enough as long as they are not to be moved away from the rail head or steamer landing, but when it becomes necessary to move one or more beyond the advance base, up to the vicinity of the divisional field hospitals—there will be trouble. The medico-military axiom "to bring the institution to the wounded, and not the wounded to the institution", should always hold. There will be many times when it would be unjustifiable to jeopardize the chances of hundreds of wounded by moving them back from the field hospitals, to say nothing of the time lost in accomplishing this.

In these premises, the evacuation hospitals will have to advance and establish themselves alongside of or near the field hospitals, releasing them for duty with the division to which they properly belong. When this is required, unless railroad or steam boats are available, the chief surgeon of the line of communications, will have a great deal of difficulty finding transportation. Doubtless by hiring civilian wagons, automobile trucks, and other vehicles by the Q. M. Dept., it can and will be done, but one feels that Straub is right when he says "it is believed the necessity of providing regular transportation for at least one of the evacuation hospitals of each division, will at once appèar in a great campaign, and provision therefore should be made in our war organization." The equipment of evacuation hospitals as laid down in the M. M. D., except for transportation, it is believed to be adequate, requiring no comment. The primary function of evacuation hospitals is to relieve the field hospitals of their encumbrance of sick and wounded so that they may be able to keep up with the mobile troops of their division.

The ideal location for Evacuation Hospitals would be on a railroad, or on a navigable stream, with good water supply, plenty available fuel (timber or coal) at hand, and good roads léading to, and away from the hospitals. When not needed to relieve Field Hospitals, as during inactive periods in a campaign, they may be used as Stationary Hospitals at the advance base, or at other depots on the Line of Communications. Many times it will be necessary, when some are forward of the advanced base, to put one of the 3 sections of an Evacuation Hospital, or even an entire hospital, to other uses. It may be necessary to put a section in at the boat landing, or rail head, to receive patients from the transport

column, holding them for transmission by rail or steamer whenever these are available.

Contagious diseases, especially measles and mumps, are likely to occur in any army. It would be unwise, not only for the patients' welfare, but from the standpoint of the prevention of disease, to ship such cases back to the base. The advance base should be the rearward limit for such cases. Here one might easily have to use a section, or all the sections of an Evacuation Hospital, to handle such a situation.

When Evacuation Hospitals are used legitimately, *i.e.*, to relieve Field Hospitals, available buildings should always be used in preference to tentage. If the hospitals they are to relieve are full of seriously ill, or severely wounded patients, it will be inadvisable to move them, and in that case, the Evacuation Hospital will take over each Field Hospital as it stands, to the limit of its capacity, replacing with one of its own sections the Field Hospital equipment, so that it may rejoin its division. It might be well to state here the importance of constant communication being maintained between the chief surgeon of the Line of Communications, and the chief surgeon of the Field Army it is serving, and the chief surgeons of the divisions in the same, and also with similar authorities beyond the base. This is requisite so that all may be mutually informed of the situation at all times, and be in a position to formulate plans which will result in an harmonious working of the system of evacuation and supply. The chief surgeon of the Line of Communications has an enormous responsibility, and should be next in rank to the chief surgeon of the Field Army he is serving. Thus he will be superior in his grade, to the chief surgeons of the divisions, the sanitary inspectors of the Line of Communications

and of the divisions, and to the commanding officers of the Base and Evacuation Hospitals, who by present regulations are all lieutenant colonels. He should therefore, when practicable, be the senior lieutenant colonel in that Field Army.

It is not contemplated that cases that are incurable, or that require special or protracted treatment, be retained in Evacuation Hospitals. Such cases should rapidly be sent to the Base Hospitals by all available transportation facilities. Those whom it is believed can be treated to a conclusion at the Advance Base, or at hospitals at the depots on the line, should be held, returning them to the colors as soon as they have sufficiently recovered. It is of great importance that the chief surgeon of the Line of Communications should be a man of tact and pleasing personality, in order to obtain the coöperation of the chief of staff, and the chief quartermaster of the Line, upon whom he must necessarily be largely dependent for transportation, and the orders necessary to accomplish the work of his department.

Before an engagement, the chief surgeon of the Line of Communications, by appropriate orders should institute the necessary steps to clear out his Evacuation Hospitals, so that they can be moved nearer to the front, and thus be available to relieve Field Hospitals as they become encumbered. In order to do this, many sick and wounded, who would ordinarily remain where they were, till treated to a conclusion, would have to be sent farther down on the Line of Communications, or to an adjacent depot hospital. The Advance Base would therefore be an excellent place to organize a convalescent camp, where many cases could be held and treated until well enough to be returned to duty. This would relieve the congested Evacuation Hospitals at the proper time, and render it only necessary to ship back to other hos-

pitals actually bedridden cases. A large personnel would not be needed in a convalescent camp. One or two medical officers, with a nucleus of Hospital Corps men, including one or more cooks, and three or four non-commissioned officers, would meet the situation, according to the number of convalescents. Many of these, especially if belonging to the sanitary troops, would be able to help or assist, as their strength returned, and lessen the detail of normal individuals, who could well be utilized elsewhere. The equipment of a regimental infirmary, with cooking facilities, would be sufficient, as rations could be served in the men's own mess outfits. Buildings would of course be used, but if not available, such tentage as the commanding officer of the convalescent camp could obtain. Many could use their own shelter tents pending arrival of other suitable cover.

From the foregoing, one sees that at the base of the Line of Communications, and at its advanced head, there will be quite a cluster of sanitary formations, with others scattered along on the line between. To my mind, it is practically necessary to duplicate at the *advance base* the sanitary units in existence at the base. So that one may find at the advance base a receiving hospital, a contagious disease hospital, a convalescent camp, and an advance branch of a base medical supply depot. Ordinarily, this would also be the headquarters, or base of operations of the transport column, and of the reserve medical supply column pertaining to the division that particular district of the Line of Communications was serving. It might also be an advantage to have attached to one of the hospitals. or preferably independently, a casual camp for sanitary troops. Such an organization would take in detachments and members of the Hospital Corps reporting while en route to the front, or men returned to duty from the hospitals

and convalescent camps, men returned from furlough, relieved from confinement, or relieved from detached service, pending a favorable opportunity to return them to their organizations. A casual camp would be assembled under an official head with a few non-commissioned officers for the necessary administration and discipline of the detachment. A cook and cooking facilities, tentage for office and kitchen would be all that the situation would demand, as the men would use their own shelter tents, and rations of course would be obtained from the nearest subsistence depot.

When a section of or a whole evacuation hospital is used as a contagious hospital, the personnel in either case would be ample, but if not, it may be supplemented from the Red Cross Society by a detail authorized by the chief surgeon of the Line of Communications. In passing on cases of the character already mentioned, and who should not be detained in the evacuation hospitals, "trains for patients," or "ships for patients" should be used whenever available. These means are both the easiest and best. Transportation of patients from hospitals to such facilities, in emergency, will be furnished by the transport columns, but it is believed that the chief surgeon would be able to assign ambulances, trucks, or civilian wagons from other sources to do this work. Should there unfortunately be no railroad or river transportation on the Line of Communications, additional transport columns would have to be organized to carry on these functions. Back of the evacuation hospitals, such columns might very appropriately be composed largely of civilian and Red Cross attendants. An official head and one enlisted nucleus would be sufficient to administer one. The wheel transportation could be of any and all kinds of vehicles adaptable for the safe and easy

transportation of sick and injured. Trains and boats for patients should have practically the same personnel as is assigned in regulations for hospital ships and hospital trains (see pars. 588 and 589, M. M. D.). It is thought that three medical officers, three noncommissioned officers, two cooks and twenty-two privates first class or privates would be sufficient for either boats or trains on the Line of Communications. A hospital fund should be administered by the commanding officers of such organizations in the interest of the detachments, and of the sick they transport. The equipment should be what experience indicates as necessary. Among these would be cooking facilities, rations and special diet articles, a detached service chest, bedding, and the usual accessories to nursing, as, for example, bed pans, urinals, extra catheters, alcohol, talcum powder, paper sputum cups, feeding cups, toilet paper, etc.

At every depot, temporary or otherwise, the company, battalion, regiment or brigade guarding it would have its regular sanitary personnel and equipment with which to establish the more or less complete place for the care of its sick. If a small organization, all hospital cases would be shipped to the nearest hospital. If a regiment or larger body, a regimental hospital would be operated in a suitable building, or if a brigade, a cantonment hospital could be set up, using the equipment of a field hospital, and any available buildings. The cantonment hospital can be made from suitable materials, as indicated in plans for cantonment hospitals kept in the office of the Surgeon General. The sanitary personnel of a regiment is quite adequate to maintain a regimental hospital, and the sanitary personnel of a brigade more than ample for a brigade cantonment hospital, using the supplies equivalent to those of a *field hospital* for so doing.

THE BASE HOSPITAL

This should be at the point on the Line of Communications, which its name implies, and receive patients sent back to it from the evacuation hospitals and various organization infirmaries and depot hospitals along the line. It is commanded by a lieutenant colonel, who has under him nineteen medical officers, one dental surgeon, eight sergeants first class, sixteen sergeants, fourteen acting cooks, and 115 privates first class and privates, and forty-six female nurses. It has normally accommodations for 500 patients, and the supplies as authorized in the table are sufficient to treat any case to a conclusion. Here specialists can be utilized, and a large number of the leading men in all branches of medicine and surgery would be available from our magnificient Reserve Corps list.

Many of the latter would of course be used nearer home, at general and other hospitals, but a number could well be occupied at our base hospitals, at cantonment hospitals, and in some instances, perhaps as far forward as evacuation hospitals. This, however, would be unusual as it is considered their best services could be rendered at the base, and back of it. Base hospitals are the nearest points to the front, at which the services of female nurses can be utilized. These might well be taken from the Red Cross whenever available, conserving the regular army nurse corps for other hospitals. At the base, female nurses will be of undoubted benefit, but it is a wise provision that apparently excludes them from advancing farther up the line, as provision for their care and comfort would practically neutralize any professional advantage their presence might yield, if sent nearer to the front. All cases permanently disabled should be sent home to general hospitals for

discharge on surgeon's certificate of disability, or discharged directly, when feasible, from base hospitals. Cases requiring long treatment, or climatic change, should be sent to hospitals in the distributing zone. To keep sufficient beds available at all times for patients sent from the line of communications, this work should always be expedited, and slightly wounded, and mild cases of sickness, promptly transferred to the base cantonment camp. The internal administration should be along the general lines of military administration, and as indicated for them in the M. M. D. Base convalescent camps should be organized on the lines already indicated when discussing such camps as advanced bases. In charge of an active medical officer, with an appropriate nucleus of trained sanitary soldiers, Red Cross nurses and attendants, convalescents received at the camp would be cared for, disciplined, and gradually exercised and drilled as their individual conditions permitted, until ready to be returned to the front again.

A sanitary casual camp would also be required at the base to receive drafts of men from the home territory en route to the front or further up the line of communications, to receive men returning from furlough, or from sickness at general hospitals, and men temporarily sent with details from the line of communications, until a convenient opportunity arises to return them to their organizations. Such a camp would be administered as the one mentioned when discussing casual camps at advanced bases.

BASE MEDICAL SUPPLY DEPOT

The necessity for such an important establishment need not be mentioned. The allowance of 2 officers and 15 enlisted men as authorized by regulations is believed to be none too generous, as they will be worked almost incessantly night and day in

an active campaign. Great foresight and judgment, and prompt delivery of supplies called for from the home territory, will be required to keep on hand what is needed to meet all contingencies. All sanitary supplies of the division pertaining to the district of the line of communications serving it, will have to be issued from this depot. When one considers that this means supply all the organizations on the line of communications—convalescent camps, casual camps, base hospitals, battalion, regimental and brigade depot camps, rest stations, transport columns, trains, ships, contagious, receiving, evacuation. and field hospitals, ambulance companies, the advanced base supply depot and the reserve medical supply column, to say nothing of the sanitary units with organizations composing the division at the front—one begins to get a faint idea of the tremendous quantities of materiél, medicines and stores, that must be obtained, and replaced, as fast as forwarded to organizations requiring them. These supplies will be obtained from home depots by rail, or by steamships if over sea, or whenever practicable and economical, by purchase from the immediate neighborhood. As the line of communications lengthens it will become necessary to have issues to troops and field sanitary units made more directly. For this reason, an advanced branch of the medical supply depot should be placed at the line of communications, to which supplies can be forwarded in bulk, and the issues made directly from that point. The supplies from the base medical supply depot, will be forwarded by the Q. M. Dept., by rail, steamboat, or wagon train, to the respective points on the line of communications calling for them, also up the line to the advanced branch of the base medical supply depot, at its head. From this latter point the supplies necessary to replenish the divisional sanitary units will be obtained by the

reserve medical supply column, and issues made directly by it. Should these organizations be able to send in their own transportation to the advance branch of the supply depot, approved requisitions will be filled there, instead of by the reserve medical supply column.

BASE CONTAGIOUS DISEASE HOSPITAL

This is the last of the organizations that I consider likely to be needed at the base. It would operate different sections for different diseases, such as measles, mumps, scarlet fever, diphtheria, etc. It would be well to isolate cases of Asiatic cholera, and cases of acute bacillary (Shiga's) dysentery in the presence of an epidemic, in such an institution. In our army the danger of a serious outbreak of typhoid fever or smallpox is now unlikely, though typhus fever is a possibility. Recruits, or new drafts, enroute to the front are almost sure to develop some of the exanthemata. What cases do not develop while the troops may be at the base, can be taken care of at the advanced base contagious hospital, being sent there from the front as such cases arise. As in all of the other sanitary departments at the base, buildings should be used for the contagious hospital. If time permitted a sort of Dücker pavilion hospital, constructed on lines as planned in the office of the surgeon general, might be erected. Except for administrative and executive heads in the person of one or two medical officers, and a few experienced enlisted men for a nucleus, the entire personnel male and female should be drawn from the Red Cross Society. This is also true of supplies, which the Government should avail itself of at every opportunity. The generosity of the Red Cross, and private funds for obtaining supplies, should never be overlooked. The actual number of male and female

nurses, and attendants, would be determined by the commanding officer of the contagious hospital, who would make timely request for them on the chief surgeon of the line of communications. This officer would order the necessary details, assigning them from such as were available, and would also o. k. any demands for supplies.

SANITARY SQUADS

Are usually organized from the personnel of every sanitary unit on the line of communications. Their functions are well known, and would be under the direction of the senior medical officer in each unit, supervised by the sanitary inspector of the line of communications, acting for the chief surgeon of the same.

This, in a general way, covers all the sanitary organizations that are authorized or that I can think of as being necessary on a line of communication.

To review the whole subject and serve to illustrate how the different parts should work, we will suppose the following situation, which I can only present in a very elementary manner. It should be thoroughly understood that the situation outlined is tactically incorrect, and not likely ever to arise, but it has been adopted simply to illustrate the use of railroads, steamers, and wagon transportation on a line of communications.

A field army has successfully landed on a hostile coast, which runs in a general direction north and south, its 3 divisions debarking at separate points. All three divisions have advanced some 60 miles into the interior. The first division fortunately found a railroad available at the town at which it landed, and its advanced base is now at the termination of this railroad 55 miles in the interior to the west, and only 5 miles from the fighting troops or front. The 2d

division landed at a point north of the first division at a town situated on a river which flows from the west, parallel to the railroad on the line of the first division. The distance between the railroad, on which is the first division, and this river is some 30 miles, but the river is navigable for paddle wheel steamers to within 4 or 5 miles of the troops of the 2d division, which are, as previously stated, some 60 miles west of the coast. The 3d division landed some 40 miles south of the 1st division. Unfortunately no navigable stream, or a practicable railroad is available. However, the roads running west are good, and a hard pike leads in that direction parallel to the railroad, on which the first division is operating. Extending their lines of communications as they advanced and using wagon, pack, and automobile trains, the 3d division has advanced 55 miles west from the coast. Communication is kept up between the three divisions by telegraph, and telephone systems, by heliograph and wireless, by aeorplanes, and by automobiles, so that there is excellent "intelligence service" at all times. All three divisions are therefore halted and holding the only passes in a mountain range at about the same distance westward from the seacoast. They have been told not to advance any further at present, as they are each confronted by forces superior to themselves, and yet apparently not strong enough to force them back. For tactical reasons, it has been considered more important for each division to hold what it has already gained, rather than to abandon any position in order to reunite the three divisions of the field army. They have therefore taken up defensive positions, pending the arrival of a second field army, which is said to be due in about one week. It is feared that the enemy may attack after receiving the latter information. It is assumed that the flanks and territory between the

divisions is covered by our cavalry, which is numerically superior to the enemy's, and that the nature of the terrain otherwise, practically restricts the enemy to frontal attacks on each division. The chief surgeon of the Line of Communications is informed by the chief surgeon of the field army that information has been obtained from spies, which leads the commanding general to expect that an attack will certainly be made by the enemy against each division 48 hours later.

What would the chief surgeon of the Line of Communications do? Through the excellent means of communication available he would institute the following steps:

He would direct the commanding officers of all hospitals, beginning at the evacuation hospitals, and receiving hospitals (except the contagious hospitals), back to and including the base hospitals, to return to duty all men that could possibly be so disposed of; to ship to the base by every available means all men who would require treatment for any extended time, and whose condition warranted moving them without jeopardizing their recovery. He would direct the commanding officer of the base hospitals to empty their hospitals of the same class of cases by hospital trains or rather, as would be in this instance, by hospital ships, to the general hospitals in the distributing zone. At both ends of the Line of Communications, all slightly wounded would be sent to the convalescent camps. In other words every effort would be made to have a maximum of beds available on the Line of Communications for the reception of prospective wounded. It is of the utmost importance to have the evacuation hospitals with at least two of their sections cleared, so that they could be advanced in the neighborhood of the field hospitals to relieve them directly, thus saving unnecessary handling and

carrying of patients. In the present instance, as the advanced bases are all within five miles of the troops they serve, the travel enjoined will not be so great, and the necessity for moving forward the evacuation hospitals probably neither urgent, nor necessary. The chief surgeon of the Line of Communications would inform the chief quartermaster of the probable need for the transportation of one or two evacuation hospitals in each division, forward from the advanced bases to the neighborhood of the troops, succeeding the impending action 48 hours later. This, in order to give him time and opportunity to plan for the assembling of the necessary transportation. He will *actually* call on him for this transportation should the situation require it, under authority delegated by the commanding officer of the Line of Communications, or by the direction of the chief of staff at his request.

The receiving hospitals at the rail head of the first division, and the steamer landing of the second division, will be emptied by their commanding officers —using extra trains and ships—and placed in condition to rapidly receive, handle, and load suitable cases on to such trains and ships, evacuating them directly to the base hospitals on the coast. The chief surgeon would probably be able to see at least two of the division surgeons personally, or if impracticable, could communicate with them by telephone, or at least, certainly by telegraph. He should inform them that the evacuation hospitals on their lines would be ready to receive patients the morning of the expected attack, and of their probable location at that specific time. He should discuss with them the points to be decided on, as locations for dressing stations for slightly wounded, so that he can send the proper personnel and supplies to the points decided upon. The chief surgeon would temporarily

assign two or three medical officers, a cook, and a dozen Hospital Corps men, with supplies, from the nearest cantonment or depot hospital on the Line of Communications; of the district serving each separate division. Supplies would probably not exceed a detached service chest, two or three boxes of reserve surgical dressings, some camp cooking utensils, or a small field range, a chest of hospital stores, and some extra rations. Any available buildings would be used for the stations for slightly wounded. If not available, lean-tos, or other make-shifts improvised from the shelter halves would suffice. The chief surgeon of each division should request that the location of their separate dressing stations for slightly wounded, of the probable position of at least one dressing station and one field hospital, and of the exact position of the advanced base, be placed in the battle order of each division for the information of their respective commands.

The transport columns, regular and auxiliary, should be ordered by the chief surgeon, Line of Communications, to hold themselves in readiness in the neighborhood of the evacuation hospitals, so that they will be available for immediate use in evacuating the field hospitals to them, or to assist in transporting the evacuating hospital forward, if it is decided to locate them beside the field hospitals at the termination of the engagement. The commanding officers of the base medical supply depots would be notified by the chief surgeon of the impending engagement, and directed to ship up additional supplies to the advanced branches to immediately replenish the mobile units with the troops, in case a forward movement should be instituted as a result of the engagement. The chief of staff, Line of Communications, would be asked to inform his chief quartermaster that all extra carts, wagons, trucks,

and autos, not actually needed for supplies, may have to be called upon, for a short time after the engagement, to assist the transport columns in the evacuation of wounded. This would apply most particularly to the 3d Division, which is dependent throughout the entire length of its communications upon wheel transportation. The chief surgeon would also telegraph to the Surgeon General of the expected action, and request that additional hospital ships be dispatched to the base to help clear it of all who need transportation. These (ships) would also be available to take on such cases almost as rapidly as they arrive at the base from the front, following the action. Finally he would inform all the chief surgeons in the field army of his plans, and the action he has already taken, as far as practicable.

We will now suppose that the action came off as scheduled two days later, and that the attacks were successfully repelled at all points, but that our own troops are too greatly outnumbered to warrant any offensive operations. The fighting commenced at 8 a.m., and was practically all over by noon. Word has been received that the 2d Field Army will land two days later, by Divisions, at the same points as the 1st Field Army. It is decided to initiate offensive operations immediately after the troops of the 2d Field Army become available.

It is therefore imperative to get all of the sick and wounded down to the bases as soon as possible, so that the organizations on the Line of Communications, will be free to handle fresh casualties following the prospective forward movement. By previous arrangement between the chief surgeon, Line of Communications, and the division surgeons, all sick should have been collected, either the night before, or early the morning of the battle, from the field hospitals in each division, by an ambulance train,

and carried the comparatively short distance to the rail head, and steamer landing, for evacuation. This would leave all four field hospitals in each division free of encumbrances. In the case of the 3d Division, these cases would be turned over to the receiving hospital at the advanced base. The chief quartermaster would have been requested by the chief surgeon to have trains and steamers at the points indicated to meet these cases. In the 3d Division, such patients would have to be sent back on the wagons of the supply train returning to the base for supplies on that day. The steps necessary for the collection of these would be initiated by the respective division surgeons as agreed upon at the consultation with the chief surgeon, Line of Communications, previously mentioned, and would be supervised by the division chief surgeons.

During the action, and afterwards, under the division surgeons, the directors of ambulance companies will have put in operation their ambulance companies, and the directors of field hospitals, their field hospitals, as it became necessary.

Under the present suppositious circumstances, it is probable that dressing stations would be found close to the troops, particularly so as the enemy was decisively repulsed. In many instances the dressing stations, following the axiom already mentioned, may have been set up very near some of the regimental aid stations, and possibly one field hospital in each division, was established some miles to the rear, but the majority would be found operating close to the dressing stations at the end of this action. Following this principle, such arrangements will have materially facilitated the work of all, and the ambulance company trains have had very short hauls, if any, to the field hospitals. This being so, these trains would be available on request of the chief sur-

geon, Line of Communications, to help in evacuating the field hospitals, to the evacuating hospitals, or directly to the rail and water heads, an average of 3 to 5 miles distant.

Let us consider the number of wounded that would have to be provided for.

We will assume that each division averages 20,000 men, and that each has sustained a 10 per cent. casualty, as the attack was pressed home vigorously before being abandoned. This will give about 2,000 casualties for each division. Following the classification given by Munson, in his *Sanitary Tactics*, this will be divided up in the following manner for each division:

Killed	20% *or* 400		
Unable to bear transportation	8% *or* 160		
Able to walk to field hospital	28% *or* 560		
Able to walk to advance base	12% *or* 240		
Not requiring transportation	68% *or* 1360		1360
Requiring transport in ambulances:			
(a) Sitting up	20% *or* 400		
(b) Recumbent	12% *or* 240		
	32% *or* 640		640
			2000

The problem for the 1st and 2d Divisions is practically the same, in that one has rail and the other steamers available for evacuating to the base. The 3d Division has a much more difficult situation to overcome, as their entire line is served by various kinds of wheel transportation. The positions of the 1st and 2d Divisions are so similar that the following observations will serve for both:

The dead are collected by details of line troops, working under the sanitary inspector of each division, with a few medical officers to verify death in each case, and the entire corps of chaplains to make the necessary identification marks on each body and

prepare the necessary records. They also conduct the burial services. As each division has about 160 wounded who should not be moved from the field hospitals, the chief surgeon, Line of Communications, will order up two sections of an evacuation hospital to care for these, taking over the patients and equipment of the field hospitals concerned, so that they will be at liberty to proceed with the mobile troops in the prospective forward movement. If some of the untransportable wounded are scattered among the four field hospitals, the two with the majority of them will be relieved directly by the sections of the evacuating hospitals. The wounded from the other two would be very carefully conveyed to the two former, releasing the latter for service with their division. Two hundred and forty wounded were able to march the short distsnce to the advance base, at which point a dressing station for slightly wounded should have been organized as indicated in the battle order previously referred to. As its situation was therefore well known to all, and directly in rear of their position, these men should have no difficulty in reaching that point. After arrival there, it is not probable that more than forty would require serious treatment, and the remaining 200 could be adequately cared for in the convalescent camp until able to rejoin their proper organization.

Five hundred and sixty were able to walk to the field hospitals, but from shock and haemorrhage or pain will probably be unable to proceed further unassisted. Of these 560, 37½ per cent will require to be evacuated in a recumbent position, and 62½ per cent sitting up. Already following the action, 640 men have been conveyed to the field hospitals from the dressing stations requiring transportation, i.e., 240 recumbent and 400 sitting up. Thus we have requiring transportation from the field hospitals to

the remaining four sections of the two evacuation hospitals in each division and other receiving institutions at the advanced base, a total of 1,200. Of this number 750 require transportation sitting up and 450 recumbent. To accomplish this, the division has the ambulance trains of four ambulauce companies and the transport column, or sixty ambulances in all. If each ambulance takes two recumbent and five sitting, the sixty can take 420 each trip. The probable distance to go will vary from two to four miles to the advanced base, which should be accomplished in an average of two hours per round trip, including time of loading and unloading at each end. Three trips, or six hours from the time of beginning to evacuate, would account for the whole number without calling on the Quartermaster Department for additional transportation. It has already been shown that some forty of those who were able to march to the advanced base may require better treatment than that furnished in a convalescent camp, so that there must be temporary accommodations for 1,240 wounded at the advanced base. What unoccupied space is there for their reception?

1. Four sections of our two evacuation hospitals in each division, or 432 beds.

2. A receiving hospital at the R. R. station with a normal capacity of 250.

By using buildings and extra supplies from the advanced supply depot, the commanding officers of these institutions should be able to temporarily expand their accommodations to 600 and 450 beds, respectively. This will take care of 1,050 wounded at once. The chief surgeon, Line of Communications, as the wounded were received, would cause about 200 suitable cases to be picked out for immediate transfer to a waiting hospital train or ship at the rail or navigation head. As soon as loaded, these

would be immediately conveyed to the base directly. This would render it practicable to accommodate the other 1,040 for a few hours or days. By judicious selection, other cases would be shipped the same day, and succeeding days, as rapidly as considered safe by the same conveyances to the base. The handling or litter work between the hospitals and trains could be performed by the transport column bearer section. Traveling half a mile each way, a bearer party of this numerical strength (forty), supplemented by details from the hospitals themselves, could probably load 100 to 125 cases per hour. The ordinary capacity of a train or ship (200) could be filled well under two hours. If necessary to expedite still more, the bearer sections of one or more ambulance companies would be sent to the advanced base, running a daily roster as long as their division was not moving forward. If the campaign had existed long enough, a Red Cross bearer company would have been organized and assigned regularly to carry on the bearer work between advanced base hospitals and the railway or steamer landing.

On a short Line of Communications which could be covered by rail in two or three or by river steamers in five or six hours, rest stations would hardly be necessary, nor would there be many intermediate depots of supplies with troops attached. It would probably be found unnecessary to ship back to the base for prolonged treatment or discharge more than 40 per cent of the 1,240 actually received in the hospitals at the advanced base. The base hospital would thus only be called upon to accommodate about 500 men as a result of this action. Its normal capacity of 500 beds could easily be expanded to 600 or 700, as it is situated so near to the base medical supply depot. Rapid selection of the cases permanently disabled and those requiring change of climate

or protracted treatment would be made, and the cases speedily distributed to the general and other hospitals in the rear. Thus would available beds be on hand for new cases from the front. The convalescent camp at both the base and the advanced base will be a great clearing house for cases susceptible of treatment in such institutions. By using this camp, the evacuation and receiving hospitals at the advanced base will soon get rid of the bulk of the 744 cases (60 per cent of total received) retained by them for treatment to a conclusion. Later on, the transport column would evacuate the 160 untransportable cases in the two sections of the evacuation hospital which went up to relieve the field hospitals after the fight, as these became able to stand the journey. With such facilities on their Line of Communications up to this time, the 1st and 2d Division should be able to be evacuated with celerity and comparative ease. When the columns begin to advance, their lines will lengthen, and unless military railroads can be extended as the divisions advance, they will be confronted with some of the difficulties which the 3d Division has had to overcome from the very start.

The 3d Division would probably have no more difficulty than the other two divisions in getting its wounded back to the advanced base. Here, however, their difficulties would begin to multiply. During the advance of this division along the Line of Communications which it now occupies, the chief surgeon has been forced to call into being every possible expedient in order to facilitate the evacuation of the sick and wounded and the forwarding of supplies. I am assuming that the Quartermaster Department has been unusually efficient and has obtained a large number of vehicles of all kinds for the use of the Medical Department, and that there is

also a large Red Cross column assigned to this district. The chief surgeon, for the use of this district of the line, has managed to obtain three transport columns in addition to the one usually allowed for a division. One of these is a regular organization, and the other two practically wholly composed of the members of the Red Cross. These transport columns have been operating between the advanced base and the base. At the time of the action indicated in this problem, three permanent rest stations had been established at points ten, twenty-five and forty miles from the base, practically one day's journey apart from each other, for an ambulance train of sick and wounded. At the advanced base a large receiving hospital is in operation to take in ordinary sick sent back from the front, but supplies were kept on hand to allow of expanding this hospital to a capacity of 1,000 beds. The additional personnel was rushed up by the chief surgeon of the line when the advance notice was given, forty-eight hours before the fight. The line had been cleared as far as possible beforehand, as in the other divisions. In the four sections of the evacuation hospitals not yet in use at this point, 500 or 600 cases could be taken in, or, only up to their normal capacity of 432. With the large receiving hospital, the remaining 600 or 700 could be accommodated. The three additional transport columns mentioned as already organized would ply between the advanced base and the base, leaving the regular transport column to continue its proper function between the field troops and the evacuation hospitals only. By running a schedule and starting in one transport column every day or every two days, the cases as they become classified and designated for further treatment at the rear, could be sent back in this way. Each transport column, by taking nine ambu-

lances with recumbent patients and three with sitting up, could convey sixty-three to the base each trip, or if all three columns travel at once, 189. It is believed that the regular schedule of one column starting every day would be better. The columns would stop at the rest stations and take three or four days for the trip. Returning a little faster, say in three days, the animals would have one day's rest, so that one round trip per week would be about the economical maximum. This of course would be very slow work, if trying to take back the 40 per cent or 496 men, which we assume would have to go to the base following this particular action. If shipped in the way indicated that number would probably occupy three weeks time, and might lead to confusion, congestion, and suffering if another action followed soon after the first. There is every prospect of this. However, every day some fifty of the division supply wagons are returning to the base empty, and could accommodate 150 wounded to the first rest station, where these would be removed, and the train proceed to the base for their supplies without undue delay. So each day 50 empty wagons could take wounded to the first rest station, picking up wounded left there and transporting them to the second rest station, and so on in this manner until they finally reached the base in batches of 150 at a time. With the consent of the commanding officer of the Line of Communications, the chief Q.M., would be directed through the chief of staff to turn over ten or twelve large automobile trucks. Each of these should be able to take 8 or 10 men at a time, and with the good roads in this case, the whole journey should not occupy more than 3 or 4 hours. This latter method of evacuation is much preferable and would be used. By special authority the transport columns with their present authorized personnel could

be equipped with ten or twelve large automobile ambulances, or light auto trucks, which travel quite fast enough for a sick or wounded soldier. If such a column is available for the use of the chief surgeon, he could have 100 to 120 men sent in each trip. To evacuate 500 men would only require about 4 trips to the base. I have not ventured to say how soon the evacuation to the base could be done by the other means I have mentioned, because I have specified no particular country as the seat of operations, nor is it necessary. If specific territory had been mentioned, the details could he followed to a conclusion, considering the distance and terrain involved on the map. However, it would not be unreasonable to suppose, under the conditions of this problem, that all the wounded of each division would have at least reached the advanced base by 6 P.M., on the day of the fight.

What I have tried to illustrate, are some of the many ways in wich the problem might be met, and perhaps, by a combination by all of them. My own feeling is, that where rail and water transportation are not available, and the roads are practicable, automobiles must be used, and should be assigned to the Medical Department in sufficient number, not only to care for the return of sick and wounded, but for the forwarding of supplies. Three or four ton trucks will be invaluable for this latter purpose in future wars, and I expect them to be used by a wise Government. Ihave not attempted to describe the minute details of a Line of Communications during a lull in operations, or during an advance or a retreat. It seemed to be sufficient to try and bring out the relation of the organizations on the line, one to the other. With the Manual of the Medical Department, and the admirable works of two members of our Corps, we have plenty of guidance. All we now need is the crystalization produced by actual experience, to per-

fect our scheme of organization and administration on the Line of Communications.

I fear that I have bored you all by my handling of a rather tiresome subject. I felt disappointed when it was assigned to me, as it is hard even for one who has a facile pen to present the subject in an interesting light, let alone one who has not that gift. One thing is certain, consideration of the subject will help us all to be better equipped to accomplish the desired results, should it ever become the lot of any of us to serve in the extremely important position of chief surgeon of a Line of Communications.

FIELD SERVICE SCHOOL FOR MEDICAL OFFICERS
Session of 1912

EVACUATION HOSPITALS

By Major Jere B. Clayton, Medical Corps

1. ORGANIZATIONS

March 10, Lt. Col. "A", U. S. V. (Major, M. C., U. S. A.) is ordered to organize an Evacuation Hospital at Portland, Oregon, to serve with a Field Army which is organizing for the defense of the Coast of Washington and Oregon. Lt. Col. "B" Chief Surgeon, L. C., is at Portland, as is General "C" in command of the L. C.

By direction of the S. G. Capt. A.M. C. U. S. A. and Lieuts. "B", "C", and "D" U. S. A., report as assistants to Lt. Col. "A". The latter also receives by wire the names of 9 civilian practitioners of medicine of Portland, Oregon, whose names have been borne on the rolls of the M. R. C. for some years and is informed that these doctors have been directed to report to him for duty. One first class sergeant and three sergeants also 20 privates first class, all with some experience in the corps, report for duty the morning of March 11th. The C. O. is directed to recruit the remainder of the men necessary to fill up his corps.

March 11, the Chief Q. M. of the L. C. is requested to hire temporary offices, (three) quarters for the men, and a store room, all in the same building if possible. The Chief Q. M. is also informed that there are 14 commissioned officers who require temporary quarters and that possibly he might be able to hire the whole of some small building or a floor in a large

building and turn it over to the E. H. No. 1. This is accomplished and the top floor of one of the office buildings in the business district is turned over to E. H. No. 1. The men are subsisted at a nearby restaurant; cots are supplied for them, and the officers use their bedding rolls and get their meals at a hotel. Captain "A", M. C., is announced as Adjutant of E. H. No. 1, and is directed to open a recruiting office as soon as the necessary supplies can be obtained. Signs for the recruiting office are ordered from a local sign painter. The National and Red Cross flags are displayed at the entrance to the building. All is in readiness to commence the recruiting by the morning of the 12th. One sergeant and two first class privates are assigned to the recruiting office and Lieut. "B" is assigned as assistant to the R. O. and informed that he will be placed in charge of the office as soon as camp is established.

Lt. Col. "A" tells his first sergeant to make a list of the blanks required, also 12 copies A. R., F. S. S. R. & M. M. D., D. R. H. C. The list of blanks being made out and checked by Lt. Col. "A", he sends one of the sergeants with personal notes to the officers of the C. S., C. Q. M. & C. Ord., also to the A. G. O. While waiting for the blanks, the Lt. Col. makes pencil notes of the articles most urgently needed and arranges with the Signal Officer for telephones. By noon the M. R. C. officers begin to come in and are told to report at nine o'clock the following morning. That afternoon is spent on the requisitions.

March 12th., the M. R. C. officers having reported are each provided with a copy of the Army Regulations, F. S. R., & M. M. D. and are told to study the articles of war and be prepared to recite on them to the C. O. at 3 p.m. The C. O. then goes to the office of the C. S. for instructions in regard to loca-

tion of his camp, when one becomes necessary, and is told that the two E. H. for the first division, will camp with the other organizations of the L. C., on the Golf Club Grounds about four miles South of the city, and on the line of the trolley and steam R. R. as well as conveniently located to take advantage of river transportation. The site is visited and it is found that the space allowed by the Q. M. who staked off the ground was the space required for a field hospital. The question of larger space is taken up by the C. S., L. C., and a satisfactory arrangement to have the space allowed quadrupled in size. Inquiry concerning the sanitary situation developes the fact that Bull Run water is already piped to the camp, and that the Club has allowed the use of its grounds with the proviso that no pits be dug for any purpose, so incinerators are to be provided for disposal of all wastes and refuse.

The C. O. returns to the office and finds that three recruits have been sworn in and that the class of M. R. C. is waiting for him. The class is fairly familiar with the A. W., and after an hour and a half spent with them the C. O. assigns the next lesson for the following day on Army Regulations in so far as they apply to the Medical Department. No provisions having been made for the recruit's subsistence they are allowed to go home for the night with instructions to return in the morning.

March 13th, recommendation is made to the C. S. L. C., to make 20 first class privates, corporals, to test their ability and fill up the cadre of noncommissioned officers and 2 cooks. Recruit instruction in the A. W. is commenced under one of the sergeants. Arrangements are made for housing the recruits in the office building and they are subsisted in the same manner as the corps has been. Clothing requisitions are made out daily for the recruits.

Short talk on Function and Management, given by Lieut. Colonel A.

The evacuation hospital is the pivot upon which the whole system of evacuation of the sick and wounded turns. Evacuation hospitals are normally located at an advanced base.

DUTIES OF EVACUATION HOSPITALS

1. Keep about two days' march in rear and relieve advanced sanitary units of sick and wounded.

2. Pass the wounded to the base hospital as rapidly as possible.

3. During the battle, keep in touch with advanced sanitary units.

4. In the event of victory, push right forward and take over the wounded of the field hospital on the ground.

5. In the case of a reverse or a drawn battle, assist the field hospitals and ambulance companies to get the wounded to the rear as rapidly as possible.

Location during or after battle should be about eight or ten miles in rear of the field hospitals. Its position should be announced in orders, so that those able to walk will be able to find it. (Attention is called to the large number of wounded in modern wars who are able to walk some distance to the rear.)

Transportation for assisting in the evacuation of the field hospital should be collected at the evacuation hospital. This means the transport column of the L. D. with such baggage wagons and civilian wagons and automobiles as it is possible to gather.

The evacuation hospital is properly only a clearing hospital and should only function as a hospital so long as it is unable to hand its patients over to the base hospital. The ambition of the commanding officer of the evacuation hospital should be to remain

empty as long as possible with equipment packed and ready to advance to the relief of the sanitary units at the front. Officers of the corps and of the line should become accustomed to seeing the advanced sanitary units packed up and ready to move on short notice, instead of being filled with sick who do not get as good care at the front as in the base hospital, and who will be an immovable incumbrance, should a movement become necessary.

Medical officers in command of evacuation hospitals should familiarize themselves and their subordinates with the terrain in their front so as to be able to make intelligent plans of action in the event of a battle.

Transportation facilities should be studied.

Convalescent camps may be established under certain circumstances.

Evacuation hospitals must be divided into three sections, capable of independent action.

EVACUATION HOSPITAL

PERSONNEL

1 Lt. Col., C. O.
1 Capt. "A," Adjutant—Records—Command detachment.
Lieut. "B," Q. M.—Com'sy.—Med. Property—Mess.
Lieut. "C," Op. Surg.
Lieut. "D," 2 Wards—Convalescents.
2 M. R. C. Op. Surg.
7 M. R. C. Wards.

1st Class Sergeants:
1 General supervision.
1 Record Office.
1 Detachment.
1 Q. M., Com'sy., Med. Property.
1 Mess.
1 Patients' clothing and effects.
1 Night duty.
1 Op. room.

Sergeants:
1 Record Office.
1 Dispensary.
1 Store room.
1 Outside police and transportation.
3 Op. room.
9 Wards.
1 Night duty.

Cooks:
8 Day
2 Night

Privates and privates first class:
8 Day cook's police
2 Night cook's police
4 Store room
1 Dispensary
9 Operating room
4 Records
27 Wards day
18 Wards night
14 Orderlies officers' horses, etc.; also outside police
1 Patients' clothing and effects
12 Transportation
19 Supernumeraries, guards, etc.

Transportation:

6 3½ ton Packard trucks

EVACUATION HOSPITAL

	NO.	WT.
Basins, white enamel	29	45
Bedding and clothing, tent units of, in canvas case	35	4680
Buckets, G. I.	27	90
Buckets, white enamel, 3 in nest, nests	9	90
Case, emergency	24	
Case, acetylene lighting and generating outfit	1	100
Chest, iron bound with 80 lbs. carbide for acetylene generator, size No. 14	1	100
Chest, commode	9	558
Chest, detached service	9	900
Chest, mess, large	3	1050
Chest sterilizer	3	300
Chest, surgical	3	300
Chest, medical	3	300

	NO.	WT.
Cups, spit, paper, metal frames for, dozens	3	
Cups, spit, paper, dozens	9	
Desks, field	3	405
Dressings, surgical, reserve boxes of, 60 lbs. ea.	24	1440
Filter, Darnall's	3	100
Gloves, rubber	72	
Hatchets,	9	18
Hospital stores, boxes of, 60 lbs. each	24	1440
Lanterns	27	67½
Ligatures, silkworm gut, coils of 50, coils	6	
Ligatures, silver wire, yards	12	
Litters with slings	60	1200
Pouches, Hospital Corps	119	
Pouches, orderly	14	
Rubber sheeting, yards	60	
Soap, germicidal	108	10
Tables, field, operating	3	100
Towels, hand	144	
Tubs, bath, folding, 2 in set, sets	3	30
Typewriter, Blickensderfer No. 6	6	35
Saddle pockets, equipped, for Medical Officers	14	
Saddle pockets with stationery and blanks, for non-commissioned officers	24	
Disinfectants		500

ALLOWANCE OF TENTAGE, SUPPLIES AND TRANSPORTATION FURNISHED BY THE QUARTERMASTER'S DEPARTMENT

	NO.	WT.
Trucks, ½ ton Packard	6	
Axes	27	90
Pins, tent, large, extra	300	210
Shovels, long handle	18	90
Spades	6	45
Tents, hospital, complete	69	13800
Tents, wall, officers	7	350

FURNISHED BY THE SUBSISTENCE DEPARTMENT

	NO.	WT.
Range, field	3	642
Rations		3500
Gasoline, oil and extra parts		1000
Rolls of men		2445
Baggage of officers		2100
Total weight		37147

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THE SANITARY SERVICE OF THE BASE

By Major William F. Lewis, Medical Corps

This service is a part of the line of communications and as such has been considered in the paper read by Major Patterson. Little attention is given it separately by any of the literature obtainable, which seems deplorable in view of its great importance. We will assume that a field army is based on a seaport in the enemy's country and that sufficient personnel and materiél have accompanied the troops to establish a base. The post selected must have suitable harbor of sufficient depth of water and preferably ample docking facilities.

The sanitary formations to be established are a Medical Supply Depot, the Base Hospitals, contagious disease hospitals, casual camps for sanitary troops and convalescent camps. The medical supply depot will keep always on hand sufficient medical and hospital supplies for the troops of the field army and all the sanitary organizations and be prepared to fill emergency requisitions from ships. This is provided for in paragraph 794, M. M. D. when authorized by the chief surgeon of the field army. Timely requisitions to assure sufficient supplies will be made. In this connection I would invite attention to the deplorable condition of the Medical Supply Service in Manila in 1899 at the beginning of and for the first six months of the insurrection. Whether the scar-

city of supplies was due to lack of transport facilities or foresight or experience on the part of officers of the Medical Department, I do not know, but remember the inferior quality of supplies which were necessarily purchased in the markets of Manila, Hong Kong and Shanghai at exhorbitant prices.

The quantity of supplies will depend on transportation facilities and character of operations, prospective duration, and the climatic conditions. The supplies needed in the tropics, for example, would differ from those which would be required in cold climates. The character of diseases expected influences supplies also. In Mexico for example malaria, yellow fever, smallpox, typhus, dysentery and pneumonia in plateau country.

These supplies should be carefully stored to prevent damage from climatic conditions and loss by theft. It is assumed that suitable warehouses of sufficient capacity could be obtained and that sufficient guard would be furnished by request of C. S. Line of Communications to the commander thereof. These warehouses should be easy of access to water and land, including rail transportation. The supply officer should have a launch and lighters belonging to the Medical Department for its exclusive use.

THE PERSONNEL

Straub says one supply depot is allowed for each division comprising the field army served by the line of communications and gives the following personnel: 2 captains and lieutenants, 1 sergeant, 1st class, 2 sergeants, and 12 privates 1st class, and privates.

The personnel allowed for a supply depot for a field army is not given anywhere and yet this depot is contemplated in paragrapa 722 (b) M. M. D., which reads as follows:

"Base Medical Supply Depots will be designated

according to the field army or other organization of which they are a part, with a suffix showing where they are located as "Base Medical Supply Depot, 2d Field Army," adding location.

In my opinion an officer of the rank of major with considerable experience should be in command of the Base Supply Depot if for only one division, and unquestionably the Field Army Depot should have a lieutenant-colonel or major in command. He should have had experience in the supply work and should have familiarized himself with problems of water and land transportation. He should have had experience in obtaining and shipping medical and hospital supplies and equipments for organizations in the field.

There should be two medical officers with the rank of captain as assistants and four sergeants—(two, first class, and two sergeants) of experience in addition to ten privates first class and privates, and a force of civilian laborers. This depot would be designated as "Base Medical Supply Depot———— Field Army at———".

When the divisional units cannot be supplied from the base depot without too much delay due to the length of the line of communications, the Chief Surgeon of the Line of Communications, with his commanding officer's approval, may send forward to convenient points on the line or at its head, one or more depots, designated as follows: "Advance Branch Base Medical Supply Depot ———— Field Army at ———."

The commanding officer of the base depot will retain command of the advance base depots and would probably place one of his assistants in charge, or have one or more medical officers not physically fit for active service placed on duty in the advanced base depots. The personnel of these depots will

have to be drawn from the Medical Department units on the line of communications, exclusive of evacuation hospitals and transport columns, and timely requisitions will be made in order that there may be constantly on hand the supplies necessary to replenish those used at the front.

No transportation for the medical supply depots is assigned, so effort must be made to procure wagons and teams from the surrounding country. The supply officer, before departing from the home port, should provide himself with sufficient funds to be used in the purchase of the necessary vehicles and draft animals.

If, of course, a good location exists in another locality and other conditions, such as rail or water transportation, make it advisable, two supply depots, one for each division, would be established.

THE BASE HOSPITALS

Before considering these formations, let us look a little further back toward the home territory where provision is assumed to have been made in order that the base hospitals can properly perform their function in the general plan of constant backward flow of the stream of non-effectives.

"The provision for hospital beds for an army is 10 per cent of its strength, of which 6 per cent is taken up by the hospitals of the line of communications and 4 by the general hospitals far in the rear," which is understood to mean home territory. (Study in Troop Leading, etc., page 198.)

Assuming a field army composed of two divisions, one cavalry brigade and one auxiliary division, making a total of 48,025 officers, enlisted men and civilians, preparation must be made for bed accommodations in general or other hospitals in the home

port or base and others convenient thereto, for about 2,000 patients.

In planning the campaign, it will therefore be necessary to arrange with these hospitals for the reception and care of this number of patients, less, of course, the number that can be placed in the general hospital at the receiving port. This hospital must be fully equipped in advance of the arrival of the wounded, using the Red Cross and civilian volunteer aid to a considerable extent. Cars should be fitted for this work and kept in convenient location so there could be no delay in forwarding the patients upon arrival. The personnel of and transportation for hospital trains should be given in the Manual, and have accommodation for 200 patients. If hospital ships and ships for patients are provided, the base hospital's work will be easily and satisfactorily done.

One base hospital will be mobilized for each division at the front, so in the field army under discussion there will be two. One for each division should be established at the base, and even if in the same vicinity it is believed to be inadvisable to combine them under the command of their senior medical officer, as permitted in paragraph 717, M. M. D., at the discretion of the chief surgeon of the line of communications. Now as to the number of beds. Four per cent of the 48,000, or about 2,000 beds, have been provided for in home territory, leaving 6 per cent or 2,880 to be provided on the line of communications, including the base. Two base hospitals of 500 beds each, and four evacuation hospitals of 324 beds each makes a total of 2,296 beds, leaving 584 to be provided in advance base hospitals, or by increasing the capacity of the base hospitals, or by both expedients.

Supplies for these 584 extra beds can be secured

by purchase or otherwise in the enemy's country if not provided for before leaving home territory.

These hospitals should be established in convenient and accessible buildings if available, and should be so located that they could be easily supplied with water and fuel, and have proper sanitary facilities and if possible sanitary surroundings.

New base hospitals may be established whenever, because of convenience to the wounded, or saving of transportation, or transshipping facilities being increased, it becomes advisable.

The Chief Surgeon of the Line of Communications may open additional base hospitals near the front or increase the personnel there when a battle is imminent. These hospitals are designated as "Advance Base Hospital No. —, 1st Field Army", adding locality. Although the location is not contemplated in M. M. D. it will avoid confusion, as other base hospitals may later be established either in neighboring territory or further along on the line of communications.

These hospitals are the receiving and forwarding depots for the non-effectives who are either out of the fight for good by reason of disability of a permanent character, or suffering from physical or mental conditions which require a long period of time for recovery.

Proper provision must be made in these hospitals for the care and constraint of the insane, the number of which will increase in a long and arduous campaign. The accommodations generally are practically as complete as in permanent hospitals. Comfort and convenience are at least found for the patients who have of necessity been hurried back from the front, often with slight regard to these luxuries.

Due preparation must be made to have sufficient beds at the base hospitals, front and rear, ready for

an influx from the field and especially just before a battle. Transportation to the home ports should be made as rapidly as possible and when transports are not available, beds must be prepared in advance in order that there may be no delay in taking over the patients from the transport columns or from other hospitals. This work of evacuation from other base hospitals to the base at the rear will be done by the personnel of the latter.

As the commanding officer of the base hospital is under immediate orders of the Chief Surgeon of the line of communications, who must make provision for the care of contagious diseases and establish a camp (for the reception, shelter and control of the personnel of the Medical Department) and possibly a convalescent camp, it would seem to be the most satisfactory plan to place these two formations under the command of the senior of the base hospital commanders at the base. The M. M. D. provides that casual camps be under the immediate command of the senior medical officer on duty therein, but this is obviously ill-advised because of constantly changing personnel.

Instruction of the enlisted personnel in the casual camp should be under the direction of a more permanent commanding officer, who in this case would have ample facilities and who would be able to utilize the casuals in the convalescent camp, which is a branch of the base hospital (M. M. D.), and in case of necessity in the camp for contagious diseases.

The personnel for the base hospital of five hundred beds, given in paragraph 587, M. M. D., is as follows:

"*Base Hospital* (capacity 500 beds).—Twenty medical officers—1 lieutenant-colonel (commanding); 1 major (operating surgeon); 18 captains and lieutenants (1 executive officer, 1 quartermaster and commis-

sary, 1 pathologist, one eye, , nose and throat are specialist, 2 assistant operating surgeons, 12 ward surgeons); 1 dentist; 8 sereants, first class (1 general supervision, 1 in charge of office, 1 in charge of quartermaster and commissary supplies and records, 1 in charge of kitchen and mess, 1 in charge of detachment and detachment accounts, 1 in charge of patients clothing and effects, 1 in charge of medical property and records, 1 in charge of dispensary); 16 sergeants (1 in dispensary, 2 in store rooms, 1 in mess and kitchen, 4 in office, 2 in charge of police, 6 wardmasters); 14 acting cooks; 115 privates first class and privates (68 ward attendants, 1 in dispensary, 2 in operating room, 1 in laboratory, 14 in kitchen and mess, 6 in store rooms, 4 with transportation, 2 orderlies, 4 in office, 12 outside police, 1 assistant dentist); 46 nurses, female* (1 chief nurse, 1 assistant to chief nurse, 42 in wards, 2 in operating room).

This could be increased by Red Cross personnel and other volunteers, which would increase the capacity of the hospital or would replace many who could be used elswhere.

The commanding officer of this hospital is the court of last resort for the malingerers and the homesick, as well as for the exceptional man who would return to the front while unfit, and great care should be taken in this last opportunity of the Medical Department in the field for incurring the retention of those effective, and relieving the fighting force of the non-effective.

*When female nurses are not available, additional enlisted men will be assigned in their stead.

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HOSPITAL SHIPS

By Major George M. Ekwurzel, Medical Corps

In this paper and the companion paper on "General Hospitals" the writer has endeavored to be as brief and concise as possible, even to the point of putting most of the subject matter in syllabus, rather than essay form. In this paper, only hospital ships under army control will be considered. The excellent article of Col. Bradley in the "Reference Handbook of the Medical Sciences" covers the subject most fully in all aspects, except the tactical, and much of the following is abstracted from his article.

The following colloquial rendering of so much of the Hague Convention of 1907 as applies to Army hospital ships will conduce to an easier understanding of the subject from the viewpoint of neutrality and international law:

1. Military hospital ships, whose names have been communicated to the enemy, shall be respected and are exempt from *capture.* They are not on the same footing as warships as regards staying in neutral ports.
2. Red Cross ships are on the same basis. They must have an official commission.
3. Privately equipped ships are on the same basis, but must be placed under the control of a belligerent with the consent of their own government.

3. As an ambulance ship. Ambulance ships might conceivably be of use in our service in such a case, for example, as the seige of a sea coast city at a distance from our main oversea base.

4. As a ship to accompany a fleet, in which medical and surgical treatment can be undertaken for as long a period as requisite. A transport fleet would scarcely be at sea long enough to require the services of a hospital ship in attendance unless the troops were badly infected with epidemic disease before starting. The problem of transferring sick men from ship to ship at sea unless the weather is unusually smooth is always a difficult one. Such ships should certainly be provided, however as they will be of the utmost use in carrying medical personnel and matériel.

Hospital ships are likely to be required in any military operations in which the United States may become engaged with the single exception of a war with Great Britain, whose overwhelming naval superiority, would render their use impossible. The fact that the land operations in such a war would be on United States territory or on territory contiguous to it would, in addition, make them unnecessary. It is highly improbable that even our liberal Congress will ever appropriate money for such ships as a part of the peace establishment, nor would such expenditure bring any adequate return. They will only be provided in a visible emergency. The number of ships needed to cope with a particular situation will depend on a number of different factors. Some of these may be combined in the following formula:—

Number of cases a year × number of days per round trip.

Average bed capacity of ships × 365, equals number of hospital ships needed. The number of

cases needing transportation will depend very largely on the sufficiency of of hospital accomodations at our advanced or rather oversea base.

Pickthorn states: "it would not be possible to maintain in peace time a sufficient number of specially constructed ships to fulfill all demands in war time, consequently we must still be largely dependent on converted ships", so the conditions even in a maritime nation like Great Britain with widely scattered dependencies is much the same as with us. The balance of opinion is in favor of constructing vessels with a view to conversion, as against converting ordinary ships in an emergency; the alterations can thus be carried out more quickly, and it seems very desirable that we should make some such preparation. Pickthorn considers it extremely important that no cargo ships be thought of in this connection—only emigrant ships. Following are some of his suggestions as to construction, capacity and cost:—

Capacity—200 sick or wounded.

Personnel—6 medical officers, 35 male nurses, and 5 female nurses.

Tonnage—5000 to 6000.

Length—450 feet.

Beam—40 feet.

Bilge keels.

Turbine engines.

Speed—16 knots.

Oil fuel.

Air space per bed—500 cubic feet. (The Relief had 238 to 312).

Cots should not be superimposed—as was done on the Relief.

Forced ventilation. mostly the plenum system, with provision for heating the incoming air.

Four large embarkation ports, two on each ward deck, with cot (litter?) hoists.

Cost of building such a ship—about $1,500,000.

Cost of chartering should be about $2,000 a day.

The rapidity of loading or unloading a hospital ship may possibly become a matter of tactical importance. Major Bradley states that the method used on the Relief was to tow strings of ships boats by launches. A boat will accommodate four patients on litters or twenty sitting up. Boats so loaded cannot be rowed, but must be towed. One launch can tow four boats. Litter squads on board and on shore load and unload the small boats. Four launches, each making one round trip an hour can load 64 bed patients or 320 patients able to sit up in an hour. The capacity of the Relief was 30 officers and 214 enlisted men.

Colonel H. O. Perley, Medical Corps, states that to the best of his recollection it was at least three months after the outbreak of the Spanish war before the "Relief" was ready for service and probably longer. It is evident that we should have particular vessels picked out for this work during peace times and actual plans for their conversion on file. War always comes suddenly and if we are not ready *before* it breaks out we will not be ready *when* it breaks out.

GENERAL HOSPITALS

It is presumed that a paper prepared for this course should refer only to conditions peculiar to war times. For this reason the consideration of every day administration of general hospitals is not taken up. Our General Hospitals in peace time are the hospital for tuberculous cases at Fort Bayard, the Army and Navy General Hospital, Hot Springs, Arkansas, the Walter Reed Hospital and the Jonathan Letterman Hospital, and in the Philippines, the Division Hospital may be almost so considered for our purposes. In war we must build additional temporary hospitals with an enormous aggregate capacity or depend on already existing charitable institutions and private hospitals, as was so largely done in the Spanish War. During the Civil War, many of these specially constructed hospitals had a capacity up to two, three, and I believe, even five thousand beds. They were largely under the control of the Sanitary Commission, and the Christian Commission which filled the same position that the Red Cross Society would do now. In order to make provision in advance for an emergency, the Surgeon General in 1906 prepared and issued plans and specifications for the construction of general hospital buildings to be used when needed. The plans call for buildings on the pavilion system, and a number of alternative groupings are shown to provide for different conditions of terrain. Of course one of the principal merits of this system lies in the fact that the hospital, as originally built, may be enormously expanded, if the need arises.

In war time the general hospital organization extends to several different formations. In the first place, there are the permanent and emergency General Hospitals, proper. Then each general hospital will have a convalescent camp for patients who are sufficiently recovered to get along without hospital treatment, but who are not yet fit for duty. These patients are borne upon the register of Sick and Wounded of the general hospital, to which their camp is an adjunct. A general hospital at a port of disembarkation of transports or hospital ships, establishes a receiving department to take over arriving patients. If there is no general hospital at such a port a receiving hospital is established and is administered as a general hospital. For the care of wounded prisoners of war, hospitals are established by the Surgeon-General at points designated by the Secretary of War. These are administered as general hospitals and are under the Medical Department, except that a line officer maintains the necessary guard service.

A normal size personnel for general hospitals may be assumed equal to those of a base hospital of 500 beds as given in paragraph 587, Manual of the Medical Department, viz.;

1 Lieutenant Colonel
1 Major (Operating Surgeon)
18 Captains and Lieutenants (1 adjutant, 1 quartermaster and commissary, 1 pathologist, 1 eye, ear, nose and throat specialist, 2 assistant operating surgeons and 12 ward surgeons)
1 Dentist
8 Sergeants, 1st Class
16 Sergeants
14 Acting Cooks
115 Privates, 1st Class and Privates
46 Female Nurses

220 Total Personnel

In many cases this would have to be materially increased. That general hospitals in war time would have a large capacity, is borne out by the experience of the Japanese, whose seven base hospitals at Hiroshima had a capacity of eight thousand beds. The class of cases treated in such hospitals may be inferred from Dr. Anita Newcomb McGee's statement that of the three thousand patients treated there, while she served in the hospital, there were only fourteen major amputations and only forty-seven deaths. As a matter of fact too large a hospital is unwieldy and better results might obtain if capacity were limited to 500.

Referring to the break-down of the British Medical Service in the South African war, Murray Guthrie, writing in the Nineteenth Century Magazine of the conditions at Bloemfontein, says: "I visited No. 8 General Hospital at the height of the epidemic, when there were some fourteen hundred cases under treatment. To the ordinary observer and the casual visitor, everything seemed satisfactory; but when I came to inquire how many patients each nurse would have to look after, if all the sick were to receive attention, and when I visited the bell tents, where men were lying on the ground with the same clothes on that they had worn for months—covered with vermin, and some fouled beyond description, owing to the nature of their diseases—it was not difficult to understand why enteric was on the increase; nor could I resist likening the hospital to a whitened sepulchre, with its rows of neat, white tents and marquees, which contained, alas, this mass of foul disease." This condition he lays to the shortage of doctors and nurses. He arrived at Pretoria nine days after that town was occupied by the British, and found things even worse in the five or six hospitals established at that point. Of course

it is understood that the English general hospital i the field corresponds more nearly to our base o evacuation hospital than to our general hospital, bu the same shortage of doctors, nurses and matérie may occur in home territory as in the field of operations and with equally disastrous results.

Under a recent proclamation of the President, the American Red Cross Society is the only agency through which organized voluntary aid in services or supplies can be proffered to the sanitary service of the Army, and this Society will undoubtedly assist us to an invaluable extent. Not only will Red Cross doctors, nurses and supplies be furnished to help out the general hospitals established by the Surgeon General, but it may be assumed that the Society will itself build and equip large hospitals to function and be administered as general hospitals. The writer is not aware of any provision that such hospitals shall be under the command of a medical officer of the Army, but such a provision does exist with respect to hospital ships, and there would seem to be equal reason for its extension to hospitals on shore. Paragraph 544, Manual for the Medical Department, provides that Red Cross personnel employed with troops are subject to military laws and regulations, and service in hospitals in which officers and men are being treated may well be regarded as service with troops. Military discipline in large Red Cross hospitals would be an immense advantage from the point of view of efficiency.

It seems to me imperative that definite and precise plans that will at least serve to base our initial work upon in organizing and running large base hospitals are needed. We have the building plans. We need equally formed plans for personnel, equipment, organization, and clerical work.

General Outline of Sanitary Order for Issue on Military Occupation of a Community

By Major Jere B. Clayton, Medical Corps

1. A Sanitary Department for the Municipality is hereby established, the personnel of which shall include such public health and sanitation officers, inspectors and employes as are now or may hereafter be provided for such municipality by order.

2. The Sanitary Department, under the immediate direction of the Health Officer of the Municipality, through its constituted personnel, shall have immediate charge of, and is hereby empowered to cause the enforcement of all sanitary measures within the limits of the municipality; the inspection for purposes of health and sanitation of all premises, public and private; the investigation of all infectious, contagious or communicable diseases; the isolation, quarantine and segregation of suspects or persons afflicted with, or exposed to, infectious, contagious or communicable diseases; the examination of foods and materials intended for human consumption, and the destruction of the same if found unfit for human consumption, and of such other measures as are required for the prevention of diseases and the pro-

motion of the health and sanitary comfort of the municipality.

3. The Health Officer of the Municipality shall have immediate charge of the conduct and administration of the Sanitary Department and of the preparation and custody of all documents and records pertaining thereto. He shall be and serve as the agent or deputy of the military governor in the issuance of permits for the burial or transfer of the dead, and in the entry on each death certificate of the particulars required. All sanitary inspectors and other employes of said department shall perform all duties under his immediate direction and control. He shall make or cause to be made for purposes of health and sanitation frequent inspection of all premises, public and private, within the limits of the municipality, and, either directly or through his subordinates, the sanitary inspectors of the department shall issue such directions and orders to owners, occupants or custodians of property respecting sanitary measures to be taken or improvements to be made in regard thereto as may be necessary, and shall by re-inspections determine whether such directions and orders have been complied with or observed by said owners, occupants or custodians. Failure on the part of any such owner, occupant or custodian, after a reasonable time, to comply with or observe any of such directions or orders respecting necessary sanitary measures or improvements is hereby declared to be unlawful, and shall be punished by a fine of not exceeding two hundred pesos or by imprisonment for not exceeding six months, in the discretion of the court.

4. The Health Officer of the Municipality and all sanitary inspectors of the department are hereby authorized, in the strict execution of their duties, to have access to all premises, public or private, within

the limits of the municipality. Any interruption of, or interference with, or resistance offered such officer or inspectors while engaged in the lawful discharge of any of their duties under the provisions of this order is hereby declared to be unlawful, and shall be punished by a fine of not exceeding two hundred pesos or by imprisonment for not exceeding six months, in the discretion of the court.

5. For the prevention of epidemics and the spread of infectious, contagious or communicable diseases, each surgeon, physician, dentist, practicant, or midwife practicing within the limits of the municipality shall report immediately in writing to the Health Officer of the Municipality, in each case known to be or suspected of being an infectious, contagious or communicable disease, the name of the disease, name of patient with age and residence, together with the date and hour the case was first seen. The following are the diseases contemplated in this section: Cholera, bubonic plague, small pox, varioloid, chicken pox, measles, diphtheria, scarletina, typhoid fever, tuberculosis, whooping cough, typhus, yellow fever, leprosy, gonorrhoea, syphilis, and chauncroid. Should there be none of the above mentioned practitioners in attendance on the case, the head of the family, parent, nearest of kin, or other person having the custody of such patient or upon whose premises the case occurs shall render such required report. Any violation of the provisions of this section shall be punished by a fine of not exceeding two hundred pesos or by imprisonment for not exceeding six months, in the discretion of the court.

6. On the occurrence of a case of any infectious, contagious or communicable disease within the limits of the municipality, or of any such suspected case the Health Officer of the Municipality is hereby c

powered to quarantine, isolate under guard, inoculate or use such other proper sanitary measures against the person so affected or suspected and all persons presumably exposed to infection as in his judgment may be necessary. Said Health Officer is hereby authorized to placard, guard and disinfect buildings, premises or property believed to have become infected by infectious, contagious or communicable diseases. Any obstruction or disturbance of, or interference with the work, operations or action of said Health Officer under the provisions of this section, or any non-compliance with the directions or orders hereunder issued, on the part of any person, is hereby declared to be unlawful, and shall be punished by a fine of not exceeding two hundred pesos or by imprisonment for not exceeding six months, in the discretion of the court.

7. All persons within the limits of the municipality are hereby required to have at all times and maintain their premises in a sanitary condition. Occupants shall be responsible for the condition of the buildings and premises which they use or inhabit, particularly as to the general cleanliness, the use and care of latrines, sweeping, the removal of waste and all accumulations detrimental to health. Property owners shall be responsible for the condition of their premises and buildings in regard to the drainage of grounds, accumulation of débris, disposition of filth, removal of unsanitary pools, and the general sanitary repair and improvement of their property. Any delinquency under the provisions of this section, or any failure to observe the provisions of the same, on the part of any person of the classes herein named, is hereby declared to be unlawful, and shall be punished by a fine of not exceeding two hundred pesos or by imprisonment for not exceeding six months, in the discretion of the court.

8. The Health Officer of the Municipality shall determine by inspection the necessity for sanitary work to be done or improvements to be made on public or private premises within the limits of the municipality. After such inspection, he shall notify in writing in detail the owner or custodian of the premises of the sanitary measures necessary for the maintenance of the same in a sanitary condition, and shall in such notification order that said measures be forthwith carried out by such owner or custodian. Upon the expiration of a reasonable time after the receipt of such notification, and as often thereafter as said health officer may deem necessary, he shall make or cause to be made additional sanitary inspection for the purpose of ascertaining whether said measures ordered have been accomplished. Failure on the part of said owner or custodian in whole or part to accomplish the said measures so ordered, upon the expiration of a reasonable time after receipt of such notification, is hereby declared to be unlawful, and shall be punished by a fine of not exceeding two hundred pesos or by imprisonment for not exceeding six months, in the discretion of the court.

9. It shall be unlawful:

(a) For any person to throw or deposit on any street or other public place, any water, paper, banana peel, fetid water or other refuse.

(b) For any person to place dead animals or refuse on the streets except to place same during the early morning hours before 8:00 A.M., in a box, barrel or other adequate receptacle along the side of the street and in front of the premises from which such refuse was taken, to be collected by such agency as the municipality shall provide for this purpose.

(c) For any person to bathe himself, herself, or

any animal, wash clothes, or otherwise defile the supply of the municipality.

(d) For any person to urinate or defecate in any street, park or other public place.

(e) To fail to conform to and comply with any of the provisions of any ordinance establishing a dry earth, pail, or other system for the removal of night soil adopted in pursuance of sanitary limits.

(f) For any householder or other person to keep hogs within the sanitary limits provided in section 9 (e).

(g) For any owner or other person having the custody of cattle, sheep, goats and hogs to knowingly or otherwise permit the same to stray or be at large on any street, park or other public place within the sanitary limits provided in section 9 (e).

(h) For any property owner or occupant of premises to fail to drain or keep clean the ground owned or occupied whereon stables are situated in which large cattle are housed, or for any such owner or occupant to allow pools to form or exist under pigpens, or to fail to keep the same or the ground thereabout in a clean condition.

(i) For any person to construct, maintain, or use any subterraneous or other way or passage for the drainage of dirty water, rubbish or excrement, into the water supply of the municipality.

(j) For any person to offer for sale cooked foods which have been, or are, exposed to contamination by flies or other insects.

(k) For any person to collect or to allow to collect stagnant water in any pool or receptacle which will serve as the breeding place for mosquitoes.

Any violation of any of the provisions of this section, or failure to observe the provisions of the same, or any regulation in pursuance thereof, on the part of any person, shall be punished by a fine of

of not exceeding two hundred pesos or by imprisonment for not exceeding six months, in the discretion of the court.

10. Public markets shall be kept and maintained in a clean and sanitary condition and shall be constantly swept. Every person in charge of said market shall be responsible for the condition of the same for the purposes of this section and liable hereunder. Occupants of stands, stalls, or other portions of space therein, are hereby required to have at all times and maintain such stands, stalls or portions of space occupied, in a clean and sanitary condition, and to thoroughly cleanse and sweep the same daily upon the close of hours of business. Any delinquency under the provisions of this section, or any failure to observe the provisions of the same, is hereby declared to be unlawful, and shall be punished by a fine of not exceeding two hundred pesos or by imprisonment for not exceeding six months, in the discretion of the court.

11. The municipal slaughternouse heretofore established, shall be devoted to and used for the slaughter of every kind of cattle, as cows, sheep, goats and hogs, the meat of which is intended for sale in the public market within the center of population of the municipality. It shall be unlawful to sell or offer for sale in such public market or in any other place within said center of population, the meat of any four-footed animal the slaughter of which has not been effected in such slaughterhouse in the manner provided for by law. Provided, that the above section does not apply to imported meat.

(a) The keeper of the municipal slaughterhouse shall have entire charge thereof, and of all operations carried on therein, save as in this section especially otherwise provided; shall be responsible for the good order and for the maintenance of the

slaughterhouse and utensils or appurtenances belonging thereto, in a clean and sanitary condition; shall be charged with the care and watch of the cattle herded in the corral of the slaughterhouse preparatory to slaughter; and shall see that all animals and meat at the slaughterhouse are ready for inspection each day by the Health Officer of the municipality or his duly authorized subordinate of the sanitary department. He shall be charged with the daily cleaning of the premises and the removal therefrom of all filth, refuse and excrement and with the disposition thereof by cremation.

(b) The keeper of the municipal slaughterhouse shall keep a register in book form in which he shall enter each day every animal killed during that day in the municipal slaughterhouse, recording in each entry the kind of animal, color of skin, approximate age, sex, brand, and other marks necessary for the identification of the same, and the name of the owner or owners thereof.

(c) Every animal before being slaughtered shall be properly inspected by the Health Officer of the municipality or by his duly authorized subordinate of the sanitary department, and if any animal be not found in good condition of health, the keeper of the municipal slaughterhouse shall cause at once the isolation of the diseased animal to prevent the infection of all other cattle within the corral.

(d) The Health Officer, or his duly authorized subordinate, shall carefully inspect the meat of all animals slaughtered in the municipal slaughterhouse and if the result of such inspection is satisfactory shall issue a certificate to the owner thereof, or to any person named by him, stating therein the date and hour of such inspection and certifying to the fitness for human consumption of the meat so inspected for such a period from and after such date and hour

as such Health Officer or his duly authorized subordinate shall fix and declare therein and such certificate shall entitle the party therein named to offer for sale the meat included therein during the period therein stated. Said certificate shall thereupon be delivered by the interested party to the municipal treasurer or his deputy who, in accordance therewith, shall authorize the sale of the meat included therein in the municipal market within the center of population of the municipality.

Should the meat of any animal, after such inspection, by the Health Officer or his duly authorized subordinate, be found to be unwholesome or unfit for human consumption, he shall so declare and his decision condemning any slaughtered animal intended for food, or any part thereof, shall be final, and upon such condemnation such Health Officer or his subordinate shall immediately take charge of the meat of the animal so condemned, receipt for same, and cause the destruction thereof as soon as practicable by cremation or otherwise, as he shall deem proper in the interests of the public health.

(e) The killing of all cattle in the municipal slaughterhouse shall be effected by 6:00 p. m. of the day previous to that whereon the meat is to be sold or offered for sale. After the killing, the Health Officer, or his duly authorized subordinate, shall make the inspection and issue the certificate provided in the subsection next preceding whenever the result is satisfactory: Provided, That the killing of hogs may be effected at 4:00 a. m. of the day on which the meat is to be sold or offered for sale, but the meat thereof shall not be removed from the municipal slaughterhouse until after the inspection by the Health Officer or his duly authorized subordinate provided for in the next preceding subsection.

(f) Every cow, steer, bull, sheep, goat or hog to

FIELD SERVICE SCHOOL FOR MEDICAL OFFICERS
SESSION OF 1912

Modern Firearms and Their Influence on the Field Work of the Medical Department*

By Palmer E. Pierce, Major, 15th U. S. Infantry

"Strategy is unchangeable in its essential features, and the wars of antiquity still furnish valuable lessons in this branch of the military art. Tactics, on the other hand, is dependent upon the nature of the weapons used; with each change in arms the method of handling troops in battle changes, and a knowledge of tactics must be sought in the lessons of the most recent wars, and in the study of existing conditions." This quotation applies not only to military tactics proper, but also to "*Sanitary Tactics.*"

It is our purpose to consider:

1. The development of firearms and their effects on tactics.
2. Losses in battle, showing what may be expected under modern conditions.
3. Character of wounds produced by modern firearms.
4. The effect of slopes with reference especially to the position of first aid and dressing stations.

DEVELOPMENT OF FIREARMS

History does not record the date of the invention of gunpowder. The Chinese and people of India are

*The data for this article was obtained from Wagner's Organization and Tactics; Mayne's Infantry Weapon; Eame's Rifle in War; Balck's Infantry Tactics; Dr. Riedinger's Effect of the Modern Projectiles; and the various military manuals.

said to have used it in the early ages, and the Saracens to have introduced it into Spain in the Thirteenth Century.

In warfare it was first used in a rude form of cannon. These cannon became important enough to be mentioned in historical accounts of battles about the end of the Fifteenth Century. Certain it is that from that date cannon began to take the place of the cumbersome catapults, springals and other machinery used for throwing large projectiles of various sorts from stones and iron bolts to putrefied human corpses.

Of course the earliest cannon were crude and almost of as much danger to friend as foe. The quaint account of the death of James II of Scotland in 1460 illustrates this. "While this prince," the chronicler recites, "more curious than became him or the majesty of a king, did stand near hand the gunners when the artillery was discharged, his thighbone was *dung* in two with the piece of a misframed gun that break in shooting, by the which he was stricken to the ground and died *hastily*."

These first guns were sometimes constructed of iron bars, soldered or welded together, and reinforced by iron hoops. They were also made of hammered iron, or plates of iron or copper with lead run between them, and later of bell or gun metal. By 1453 the Turks were using brass cannon of great size. They had no carriages and were moved over the ground by handspikes and fired from the ground, the muzzle being elevated with wedges, and the breech sunk in the earth. Famous among these was the great gun of Mahomet II, the bore of which measured twelve palms. It fired a stone ball weighing 600 pounds, and it took 200 men and sixty oxen to transport.

By the end of the Fifteenth Century, bronze guns began to appear on the battlefield. They were of many calibers, of great length, mounted on heavy and unwieldly carriages without limbers, and fired projectiles of stone, lead, iron or bronze. The noise of their discharge was counted on, rather than material effect.

"The introduction of the musket really marks the birth of modern infantry, and its growth in importance has since been in direct proportion to the improvements in the weapon which the invention of gunpowder first placed in its hands." The first muskets were introduced about 450 years ago. They had straight stocks, about an inch caliber, and fired a 5-ounce stone ball or a 7½-ounce iron one. Their extreme range was about 200 yards and it took some ninety-four distinct motions to load this cumbersome weapon.

For some fifty years it was a debatable question whether or not the matchlock was a better weapon than the cross bow.

It was succeeded by the harquebus or arquebus, merely a lighter form, fired still with a match but did not require bearers and a rest. The men of the bow, pike and lance called the bearers of these more efficient weapons "hell born murders" and even claimed the excessive slaughter caused by them was contrary to the Rules of War.

SUCCESS IN BATTLE DEPENDS ON FIRE SUPERIORITY

Our Infantry Drill Regulations state: "In a decisive battle success depends on gaining and maintaining fire superiority." That this fact was recognized by the great military leaders of former times

is shown by the formations they adopted to secure it.

The musketry fire of necessity being slow, pikemen were at first used to receive or make a charge. For instance Maurice of Nassau (1584-1609) formed his pikemen in ten ranks at close order and between them his musketeers with 3 to 6 paces intervals. Each musketeer after firing would rush among the pikemen for protection while loading, after which he would return and await his turn to fire.

During the Thirty Years War Gustavus Adolphus (1611-1632) shaped all the details of the organization and tactics of his army to the great aim of increasing its mobility and the effectiveness of its fire action. In place of the slow match the musket was equipped and a wheel lock, in which flint striking against a revolving wheel was used to ignite the charge. The number of the ranks was reduced to six, which in battle deployed into three, the front rank kneeling so that all could fire. He created an artillery which could fire rapidly and make quick changes of position.

In his German campaigns he used 4 pounders, iron guns drawn by 2 horses. It is said these guns fired 3 times as rapidly as the infantry muskets. "The Imperialists, using a single line of heavy columns from 10 to 45 ranks deep, were outflanked by the smaller army of Gustavus and were unable to cope with its *greatly superior fire.*

During the War of Louis XIV, (1643-1675) the invention of the flint lock musket and the bayonet caused the pike to disappear. The ranks were reduced to four, the two rear ones loading for the two front ranks.

The artillery was greatly improved. The guns were all made of bronze or of iron and cavars cartridges were introduced.

Frederick the Great 1740-1763), like the great Swede, saw the importance of mobility and fire action for infantry and brought both to a high degree of perfection for those days. The ranks were reduced to three and the rapidity of fire was increased to the remarkable number of six shots per minute. Considering the flint lock musket of those days this seems an incredible number.

Frederick's great victories were all won by moving his army by the flank, so as to place it oblique to and outflanking the enemy's line and then wheeling into line and attacking the hostile flank with *greatly superior fire* which was followed up by fierce bayonet charges.

At this time the bayonet was of great importance since the effective range of the musket was only 100 yards and in damp weather it was useless as a fire-arm. However, Frederick owed his success almost entirely to the *firing* and maneuvering power of his army, which, though extremely slow and clumsy in comparison with modern armies, was immeasurably superior to its adversaries.

He did little to develop artillery, but made better use of it during his later campaigns than his first.

During the Wars of Napoleon the organization of armies became more flexible and the great innovation was made of using small columns for maneuver and assault and *deployed* lines for firing. This was an enormous stride in the direction of *mobility* and *effective fire.*

His wonderful use of artillery is too well known to need comment, except to note the introduction of shrapnel about 1808.

During these wars the fire of the British Infantry was much better than that of the French. Wellington's success has been attributed to the superior training of the British soldier in *musketry firing*

The *flintlock* was still in use. Although the percussion cap was invented about 1807, it did not come into general use until the *forties*. The fire of infantry was very deadly at short ranges but did not amount to much beyond 200 yards.

Our Civil War, celebrated for its long duration, its stubborn battles and its enormous loss of life, is also remarkable as a turning point of tactics, there being scarcely a feature of the tactics of the present day that did not have its germ, its prototype, or its development in that great contest. The Union and Confederate armies were both armed with the rifle, having an extreme range of 1000 yards and a deadly range of half that distance. The breech loader made its appearance among the Union forces during the war. The marksmanship and skill in handling firearms were of a high order in both armies and the *infantry fire* was so deadly as to effect marked changes in infantry tactics.

The effective rifles with which the troops were armed and the wooded country which formed the theatre of so many of the principal campaigns combined to develop the use of skirmishers, and to carry their employment to a degree before unknown.

The Franco-German war found both combatants armed with breech-loading rifles. The French Chassepot would kill at 2000 yards, about twice the range of the German Needle Gun.

MACHINE GUNS

The first form of the machine gun was made by Gatling in 1861. A little later the Bavarians made a 4-barreled Field gun and the French the 25-barreled Mitrailleuse.

Hiram Maxim is the American inventor of the class of guns using the force of the recoil to open the breech and load the piece. Through his inven-

tion it is possible to fire an average of 500 shots per minute from the Maxim small arm gun.

All modern machine guns fire the ordinary small arm ammunition. In our service there are now 2 of these per regiment but our Field Service Regulations provide for six united in a separate company. The relative value of a machine gun to infantry is given as about 1 machine gun to 50 or 60 infantry rifles. (Balck).

SMALL ARM RIFLE

The wonderfully proficient modern small arm rifle is the result of a slow evolution. The maximum range of our Springfield, with elevation of 450, is about 3¼ miles. It takes some 31 seconds for the bullet to go this distance, and in doing so it rises above the horizontal a mile and a quarter and strikes the ground at an angle of 68°. It has an extreme danger space of 718 yards,

The angle of fall at 1000 yards is only 1½° and the extreme height reached only fourteen feet. At 500 yards the bullet will penetrate 24.3 inches of white pine boards, 18.8 of loam and 2 to 4 men depending on where and how struck. At 1000 yards it will still pass through 12.8 inches of pine, 1½ feet of loam and 2 men.

The projectile weighs 150 grains, is jacketted with cupro-nickle. It is propelled by a charge of pyro-cellulose powder similar in composition to that used in the sea coast and field guns. The grains are cylindrical, single, perforated and graphited. The normal charge weighs from 48 to 50 grains, depending on the powder used (U. S. Mag. Rifle, pp. 43-44). The velocity produced at the muzzle is 2700 feet per second. To accomplish this a powder pressure of 49,000 pounds per square inch is required in the chamber.

With this weapon an expert can fire 25 aimed shots in a minute.

Our rifle is among the best in use at the present time. The Germans use a similar small arm but with less refinements of the sight and without a wind-gauge. Their bullet weighs slightly more than ours, has an initial velocity of 2800 feet per second, and rises only 13 feet in going 1000 yards. The projectile is steel coated and penetrates 32 inches of pine to 24.3 for the Springfield.

The latest form of bullets has been in existence only a few years. It has a sharp point and is so elongated that the center of gravity is thrown far back, which makes it tend to tumble.

The tendency to tumble has been obviated by its great rotational velocity.

The French bullet is unusual in having its greatest caliber at the middle.

The Canadians have a new rifle, (the Ross), with a caliber of 28, muzzle velocity of 3100 feet and a danger space of about 1000 yards. On account of its high velocity this bullet has a great stopping power in spite of its small caliber.

England has just adopted a new small arm, the details of which are carefully concealed. It is known, however, that it is not automatic. In all likelihood it is on the order of the Ross rifle mentioned above.

Automatic rifles are being experimented with by many nations. The Germans are said to have a satisfactory type, but on account of the expense, will not arm with it until some other nation adopts one. The Mexicans say they have a satisfactory one in the Mondragon, but the troops have not been armed with it.

About 250 shots per minute can be fired by these small arm automatics. The difficulty of supply and

the waste of ammunition, as well as the inaccuracy of fire, are points against their adoption as well as the great expense. In time, however, we may look forward to automatics as the next step in the development of small arms.

MODERN ARTILLERY

The developments of modern artillery have been too great to describe adequately in this paper. You all know the type of field gun with its steel shield, its armored caisson and wonderful recoil system, which makes it possible to fire with the extreme rapidity of eight to twelve rounds per minute.

There are about 250 bullets in our shrapnel with a bursting charge in rear. This charge throws the bullets forward with an added velocity of 250 feet per second. At 6,500 yards (about three and two-thirds miles) the shrapnel has a remaining velocity of 700 feet per second and the bullets therefore would have a velocity of 950 feet per second on the bursting of the projectile. This would make it able to kill at 200 or 300 yards from the burst, since a maximum velocity of 325 to 410 feet per second is necessary to kill. The angle of fall at 6,500 yards = 27° 6.8′. To this must be added the increased angle of the lower part of the cone due to the burst of the shrapnel. The maximum value of this angle is about 7°.

ANGLE OF FALL OF PROJECTILE

Range yards	*3-inch Rifle Angle of fall*	*Springfield Angle of fall*
500	35.3′	21.9
1000	1° 27.3	1° 29.7
1500	2° 38.6	3° 37.4
2000	4° 7.6	6° 46.4
2500	5° 48.8	11° 16.4
3000	7° 41.2	17° 2.4

LOSSES IN BATTLE

In both the Boer and the Russo-Japanese wars the *paramount* necessity of obtaining *fire superiority* was accentuated by innumerable examples.

In writing of the Russo-Japanese war, General von der Goltz says: "In modern combat success is determined by an irresistable impulse toward the enemy combined with infantry fire. It is the infantry attack that compels the defender to engage in the fire combat and to leave his trenches, thereby offering to assailant infantry and artillery vulnerable objectives. Moreover, it is above everything else infantry fire, delivered in the progressive approach of the position to be taken, that inflicts upon the enemy the greatest losses, shatters his morale, and finally breaks his will power. It is infantry fire especially that characterizes modern combat."

At the battle of Gravelotte, on the 13th of August, 1870, of the German losses, 94 per cent were due to the French infantry fire, 5 per cent to artillery and 1 per cent to swords, lances and bayonets. (Mayne's Infantry Fire Tactics, p. 249.)

During the whole Franco-Prussian war the French artillery inflicted but 8 per cent of the German losses.

The average losses of the Russians and Japanese in their late war were:

Losses through rifle fire - -	85.9
Losses through artillery fire -	11.4
Losses through cutting weapons	2.7

(Balck, pp. 167-168.)

The complete statistics for the First Japanese Army which was engaged in field operations entirely (not siege) are:

Rifle wounds - - - - -	84.
Shell, wounds - - - -	14.
Bayonet wounds - - -	.9

Of the rifle wounds:

32.03 per cent were severe.
53.5 per cent slight.
14.47 per cent very slight.

The Third Army engaged at Port Arthur until Mukden:

Rifle wounds	59.4
Cannon wounds	19.63
Bayonet wounds	.59
Miscellaneous wounds	12.13
Untraceable wounds	8.11

Location of wounds in 7,489 cases taken at random, Japanese Army:

Head and neck	16.08
Trunk	30.31
Arms	25.6
Legs	28.26
Sexual organs	.2

EXPECTANCY OF LOSSES

It would be a very desirable thing if medical officers were able to look over the field of the approching conflict and from a knowledge of the plans of the general commanding be certain of the number and kind and whereabouts of losses to be expected. But these will depend on unforseen events to such an extent that it would be idle guessing to do more than generalize on the subject.

One knows for instance that the attacking party will suffer little loss except from shrapnel up to a mile of the enemy. Just how much loss from artillery fire may occur will depend on the efficacy of the enemy's fire, the cover available and the use made of it. For instance, Captain Solovier, Russian Army, relates:

"A battalion of the "N" Rifles Regiment was to replace our regiment in our position, while we

were designated for the attack. It was still light, about 5 p. m., and the fire on both our side and that of the Japanese had slackened. I began to scan the neighborhood through my field glasses and saw suddenly most clearly and distinctly a column emerging some 1½ versts (1750 yards) in rear of us. It advanced slowly from behind a hill in column formation, by sections, to a wide, open plain of harvested kaoliang. The column was marching in excellent order according to peace time regulations: In front rode the commander of the battalion, followed by his adjutant, in rear of whom rode the commander of the leading company, while behind him marched the lines of the men. Suddenly something unimaginable took place—something which awed even those who were accustomed to battle.

"It must be said that some half hour before, a Japanese battery, stationed in front of us, left its position and took up another position opposite our flank. We could see this change of position very well from our hill, and for several minutes we took advantage to open a fierce fire against the Japanese. The battery soon disappeared and opened no fire.

"We had forgotten all about it. But it had noticed from a distance the column coming up to us, and hid and waited.

"As soon as the first company emerged on the plain and had shown itself as on the flat of the hand, it was suddenly encircled with the smoke of shrapnel explosions as with a mist. We could see clearly how the projectiles burst in the very center of the column, dispersing the men; how they surrounded it as with a circlet of flames; how they exploded right in front of the column, in the very faces of the men; and how, as the troops advanced, the projectiles shifted, not losing aim for an instant. For some minutes the column marched through the smoke, but as soon as it disappeared in rear of a hill the fire ceased. But a long row of black, immobile figures was left behind. These few minutes cost the battalion several tens of lives. The fire lasted some five or six minutes, and we counted approximately some 60 shrapnel fired at the men.

"The following companies proceeded at a run, according to the generally adopted formation, and arrived safe.

"War is terrible, through the fact that every mistake, every error, brings about immediate punishment and often very severe chastisement."

When troops get within a mile of the enemy they may expect to suffer more or less from the long range infantry fire. Here again, however, the losses cannot be accurately foretold. Let us consider the British losses at Colenso for illustration.

The total British loss was 71 officers and 1048 men. Of these Hilyard's brigade lost 209 and Hart's 464. The difference was due to the improper formation General Hart adopted for his troops. Had he used the deployed lines General Hilyard did his losses would have been much less, Instead, however, he marched his 32 companies in company column within effective range of the Boers and heavy losses were inevitable.

This but illustrates the fact that the Chief Surgeon should not rely too much upon assumptions as to probable losses and where they will be suffered. To be able to foretell them would require more than good judgment of terrain and profound knowledge of tactics. The human element, as noticed in the above case at Colenso, and also the great element of chance would have to be accounted for. Therefore the dressing stations and the field hospitals must not be prematurely located to care for expected losses that may never occur, or if they do may be in another part of the field of operations.

Let us follow the attack of the Kaiser Franz regiment on the French position at St. Privat in the Franco-Prussian war. "As soon as the enemy's fire began to be felt the flank companies of the 2d Battalion, first line, deployed as skirmishers, and, soon

after the half battalion on the right pushed forward abreast of the leading battalion, while the other three half battalions formed similarly on the left of the Second. The fire of the French was murderously effective. The men fell rapidly on all sides. In an instinctive desire to close with the enemy, the troops rushed forward. The columns lost their cohesion. The companies melted into small groups, and unable longer to endure the enemy's fire, the regiment finally halted and united the wrecks of the companies at 500 yards from the French position. Here unable to advance and unwilling to retire, it lay down and continued to fire. In 10 minutes 3 brigades lost 6,000 men; within half an hour 5 battalions had lost all their officers. The attack was a dismal failure, and it became evident that tactical science had not kept pace with the improvement in weapons."—(Koënig).

In general it can be expected that up to 2,000 yards the losses will be due almost entirely to shrapnel; from 2,000 yards down the small arm projectile, whether delivered from machine guns or the infantry rifle, will produce most of the casualties.

In a successful attack the greater part of the casualties may be reasonably expected between 1,200 and 600 yards. When the troops get within 600 yards, fire superiority must have been gained. In consequence the defensive fire is kept down and comparatively few casualties will be experienced during the final stage of the assault by the attacking troops.

The effect of the modern firearms upon men's nerves and shooting ability is so great that only from one-fortieth to one-seventieth of the expected hits will be made. By expected hits is meant the hits that would result under similar conditions, firing, however, as on the rifle range in time of

peace. This explains why in the late Russo-Japanese war it took 2,000 bullets to make a hit. The statistics of the best shooting in a battle shows that at Chickamauga 204 bullets were fired for every hit made.

CHARACTER OF WOUNDS

Let us now discuss the character of wounds given by modern projectiles. The exhaustive report of Major Charles Lynch, M. C., an observer during the late Russian-Japanese war goes into this subject most thoroughly. (See pp. 191-194 of Major Lynch's report.)

It is seen from the above report that wounds made by ricochets, which are usually tumbling projectiles, are especially severe. Bullets ricochet most frequently on water, on rocky and hard ground—rarely on wet meadows, tilled soil, and not at all on sandy soil. By actual tests our small caliber bullets are apt to tumble on grazing small twigs, corn stalks, etc. By numerous experiments it has been determined that about 17 per cent of all direct hits are made by ricochets over ordinary ground.

A noted German surgeon, Dr. F. Riedinger, made an exhaustive study of the effect of the modern small arm projectile. In part, he reports as follows:

"We will not enter on the tactical question of the bullet. This is beyond our sphere. The main question for us is whether or not our work in the field will be materially changed by the new bullet.

"The center of gravity of the entire matter lies in the question of the rotation of the bullet, and in the sideways striking of the bullet.

"If the bullet remains in the original position, then hits in the fleshy parts of the body will be far simpler than heretofore. This holds good also for spongy bones. But whenthe bullet strikes sideways a larger alteration of the fleshy part will occur and

the canal made by the bullets will expand sack-shaped, which, however, may be of little importance therapeutically.

"The splintering zone on the diarhyses of the long hollow bones (that is, the length extension) will not be materially changed. In consequence of the high initial velocity, however, the crushing of the bones, especially at the most usually used ranges, will be materially increased in spite of the decreased lateral effect. The splinters will be more numerous and smaller. * * *

"When bullets strike sideways, the crushing effect not only is increased in bones but the skin wound is also enlarged. With this enlargement the danger of infection and the possibility of conservation therapeutics decreases slightly. Small pieces of cloth are also easier driven into the wound. They are not at all so unimportant as has been held to be the case by many authorities.

"If the bullet meets in its full energy a very strong resistance, for instance the crista femoris, spina tibiae and others, then, similar to when striking water, the jacket may be torn and the lead core dispersed in the fleshy parts, causing serious wounds.

"The *very sharp point* of the present bullet is probably more suited to cut the blood vessels than the former ogival bullet. Consequently, we have to reckon on more frequent hemorrhages.

"If heretofore larger nerve centers were pierced by the old bullet, this will more frequently happen now with the pointed bullet. The large intestines appear to be in more danger now than heretofore. Fessler reports that in twelve shots fired into the abdomen, the intestines were unhurt in but one shot.

"The prognostic concerning cranium hits has assumed a worse aspect on account of the increased

splintering, according to Hildebrandt and Schaefer.

"In clean hits there will be no difference where the breast is hit. But where the bullet strikes sideways the perforation will be less favorable than heretofore.

"Considering all of the above, many shots will show an increased wounding effect. But they are offset by a large number of less serious wounds. According to how we regard the first or the second group will we overestimate or underestimate the effectiveness of the bullet. * * *

"We may register with satisfaction the fact that nowadays hardly 10 per cent of those wounded who receive proper hospital treatment will succumb to their wounds. The remaining not only escape with their life, but in many cases soon return to the ranks in front. In any case conditions are different today than they were about one hundred years ago, when Pelletan was justified in saying, '*Ce u'est que la mort, qui evacue chez nous.*'

"During the Napoleonic wars the losses in battle averaged from 20 to 30 per cent. I need not refer to our own losses during the Civil war. The question that interests us is the loss to be expected in future wars with the modified bullet and vastly improved weapons. We can get some idea by considering the losses during the last great war between Russia and Japan. The latest form of bullet was not then in use, but conditions were similar to those now existing as far as armament is concerned.

"According to H. Fischer, the Russians lost 24 per cent in dead and wounded, or a total of 142,400, and the Japanese 31.7 per cent, equal to 171,000 dead and wounded. These figures do not include the losses during the siege of Port Arthur. Including these the Russian total loss was 29 per cent, or 170,600, and the Japanese 40.9 per cent, or 220,800.

Schaefer estimates that every third Russian on the battlefield was wounded."

LOCATION OF FIRST AID AND DRESSING STATIONS

The great range of the small arm as well as the artillery of modern armies, the rapidity with which these weapons can be fired make the proper location of first aid and dressing stations on the battlefield a difficult matter. The surgeon must know how to read maps and quickly appreciate the features of the field of operations. He must thoroughly realize that because a dressing station is out of view of the enemy it is not therefore necessarily safe from his fire.

It is a fact that a dressing station on some reverse slopes would be more exposed to fire than if it were on a crest where the Red Cross flag might gain some protection for it.

In seeking to locate dressing stations, the surgeon should endeavor to avoid reverse slopes that are apt to be swept by fire directed at the fighting lines in front. However, it is only by a careful and detailed study of this part of his art that the surgeon can become proficient in the location of his stations for the wounded. He must know how to estimate slopes and what are the approximate angles of fall of projectiles at various ranges. Knowing these and the tactical dispositions of the troops, he will be able to do satisfactorily this important part of his work.

CONCLUSION

In conclusion, I wish to call your attention to the fact that the subject given me has not been exhausted. The time available is too limited for exhaustive research and report. However, it is hoped some information may have been obtained from our consideration of the influence of modern firearms on the field work of the Medical Department.

Impressions of a Combatant Officer Concerning the Sanitary Service of the Japanese Army in War

By Lieutenant-Colonel J. E. Kuhn, Corps of Engineers, Director Army Field Engineer School, Attaché with the Japanese Army, Russo-Japanese War

In endeavoring to relate to you some of my impressions regarding the Japanese Sanitary service during the late campaign in Manchuria, I can do so only from the standpoint of a layman.

Impressions being purely personal, what I shall have to say must necessarily partake of the character of personal reminiscences, even though such a course lay me open to the charge of egotism.

It is of course well known that the Japanese sanitary service acquitted itself in a highly creditable manner during the Russo-Japanese war and this fact alone is remarkable when we consider that Japan had but so lately emerged from a state of mediæval civilization which, so far as arts and sciences are concerned, was comparable to that of Europe in the fourteenth century. With no inherited traditions, with no accumulated experiences, the Japanese Sanitary Department, judged by all reasonable standards, made good in a war waged along the most modern lines, in which the magnitude and duration of the battles considerably exceeded any of those of the preceding century including the Napoleonic and Franco-German wars. That there were flies in the

ointment goes without saying, but this cannot alter the verdict as to the eminent success of the Japanese sanitary service in the care of the wounded and in the maintenance of the health of the armies.

It is pertinent to inquire as to the fundamental reasons for the uniform success of the Japanese military machine and this I attribute to two main factors, viz., thorough preparation and complete organization. In the matter of preparation Japan was benefited by her experience in the Chino-Japan war of 1894-5, which disclosed the weakness of her then sanitary service. Further, the certain knowledge that war with Russia, as a result of the war with China, was inevitable, must have proved of no small assistance in Japan's preparatory measures. A knowledge of your enemy and of the terrain of operations will certainly contribute materially in forming correct conclusions.

In the matter of organization Japan enjoys the advantages of universal military service and a form of government in which the influence of the ruler rises above the bickerings of political parties. Under such conditions schemes of organizations best adapted to the interests of the country and the army are more readily carried out than in a country having the political institutions peculiar to the United States.

Thorough preparation and complete organization, I repeat, were the fundamental elements to which the success of the Japanese sanitary service was due. Everything seems to have been carefully thought out and provided for, leaving nothing to chance. A job for every man and every man on to his job, in other words, specialization was also a marked feature of the Japanese organization which aided largely in the orderly conduct of its business.

Without attempting to discuss *in extenso* the details of sanitary organization it may be well to

sketch it in its broad features and this can best be done by considering the field and home organizations separately.

The field organizations consisted of the sanitary personnel and units attached to the field armies and of those attached to the lines of communication in Manchuria. As in other organized armies each division was completely organized with respect to its sanitary personnel, which comprised an allowance of two medical officers and 4 sanitary soldiers with each battalion, one sanitary detachment comprising a sanitary company and two bearer companies, and four field hospitals. The Japanese mobilization tables contemplate six field hospitals to a division but due to shortage of personnel, but four were actually formed for the war. The total commissioned and enlisted sanitary personnel, on the basis of four field hospitals, totals 1123 with 89 carts and 247 animals. This does not include company bearers of whom there are four per company. Comparing the foregoing numbers with those prescribed in our Field Service Regulations we find that our divisional sanitary personnel consists of 978 commissioned and enlisted with 110 vehicles and 836 animals. It is therefore seen that the Japanese provision in personnel exceeds ours considerably but that in the matter of transportation it is considerably less. In the Japanese division the sanitary personnel constitutes about 7.3% of the rationed strength as compared with 5.3% in a United States division—this liberality in personnel should be specially noted for we find it not only in the division, but also in the lines of communication in the field and in the home organizations.

In addition to the attached sanitary personnel above given, each Japanese division also possessed the following field units which were kept on the

lines of communication of the army to which the division belonged;

1st—A sanitary reserve comprising a normal personnel totaling 197.

2d—A department for transporting patients comprising a normal personnel totaling 33.

3d—A divisional medical supply depot comprising a normal personnel totaling 67.

The foregoing medical units carry the sanitary service to the main lines of communication of the field armies and complete the sanitary organization under the control of the chief surgeons of divisions and armies.

In addition there were chains of hospitals on the main lines of communication under control of the chief surgeon of the garrison of the occupied territory which carried the sanitary service to the several landing bases in Manchuria and completing field organizations. No accurate figures of the lines of communication hospitals are available as they were subject to considerable fluctuation depending upon the necessities of the moment, but as these hospitals at the end of the war had a capacity for 24,000 patients, it is probable that the sanitary personnel was not far from 3,000.

Coming now to the home organizations, these consisted mainly of the following:

1. Hospital ships
2. Hospital trains
3. Division supply depots
4. Convalescent camps
5. Medical supply depots
6. Hosp. for prisoners of war

No reliable figures as to the personnel of the home organizations are available but the total could not have been far from 20,000 all told.

Remembering that at the end of the war Japan had no less than 20 divisions in the field the total sanitary personnel in the field and at home must have totaled approximately 50,000 men. The object in

presenting the foregoing figures is merely to show the enormity of the requirements of the sanitary service in a modern war engaging the energies of an entire nation. Those who may be interested in the details of the sanitary organization are referred to the able and exhaustive report of Major Charles Lynch, Medical Department, U. S. Army, printed as Part IV of the official reports on the Russo-Japanese War.

As regards the functions of the several sanitary units in the field at home they were briefly as follows:

1. When hit the man is first dressed using his own first aid package or a dressing of the sanitary soldier belonging to the battalion.

2. If he cannot walk he is carried pick-a-back by company bearer or by attached sanitary soldier to the accidental or regimental dressing station of which there may be one to three per regiment, maintained by the battalion surgeons. Here his wound is always redressed.

3. He is then carried pick-a-back or by stretcher to the dressing station proper of which there are normally two to a division, maintained by the military detachment of the division. The transport of the wounded man to the dressing station proper is by the men of the litter bearer companies. At the dressing station proper the man is examined and often redressed. Splints may be put on and minor operations performed. Cases are also diagnosed as mild or severe and the patient tagged with colored labels.

4. The patient is next conveyed, if he cannot walk, by cart or stretcher to the field hospital, 1½ to 2 miles in rear. Here he is always redressed and major operations may be performed. Here the pa-

tient usually remains several days but never longer than a week.

5. The next step is the transfer to a standing hospital which is organized and maintained by the Sanitary Reserve of the Division. In practice the standing hospitals are formed by simply taking over the patients from the field hospitals freeing the latter for further operations. The patient may remain in the standing hospital as long as a fortnight.

6. His next transfer is by cart or stretcher to the rail head whence he is transported to some hospital on the lines of communication. If destined to be sent home this hospital was the one at Dalney.

7. He was next transferred by hospital ship to a home port in Japan, either Ujina or Hiroshima, thence by hospital train to the home divisional hospital.

8. Finally, if necessary, he was taken by train to some one of the convalescent camps, generally established at health resorts, where he was given a chance for complete recovery.

The noteworthy feature af the Japanese system for evacuating the wounded was the speed with which patients were evacuated. Every effort was made to remove a wounded man from the firing line, not only in the interests of the man himself but for the effect produced on his comrades.

All men who could by any means walk were required to make their own way from dressing stations to the field hospitals. A familiar feature of all the battles was the continuous stream of wounded soldiers, bandaged on the head, arms, body and not infrequently, feet and legs, painfully and laboriously making their way to the rear in search of the field hospitals whose location, usually in a Chinese village, was marked by a conspicuous red cross flag carried high into the air on a tall pole. A glance at the face

of many of these men left no doubt as to their physical suffering and I am certain that no such practice would be tolerated in our service. If it was and the facts became known it would result in a show of popular disapproval that can be better imagined than described.

BATTLE OF LIAOYANG AND STREAMS OF WOUNDED—SEVERAL BATTLEFIELDS CLEARED PROMPTLY—CASE AT PORT ARTHUR.

A like haste seems also to have been manifested in the evacuation of the field and standing hospitals for which the means were far from adequate, judged by humanitarian standards. The Chinese and Japanese carts employed for this purpose are springless and rigid and on the rough Manchurian roads must have jolted the wounded sufferers fearfully. The department for the transport of the wounded had no wheeled transport for this purpose and depended upon hired Chinese carts, coolies and any available empty Japanese carts. There were no hospital trains in Manchuria and the wounded destined for transport to hospital on the line of communications or home were loaded into any available box or flat cars. What this meant during bitter weather and for a slow haul of 200 miles as occurred after the battle of Mukden may be imagined. But then the Oriental is a stoic, and probably views bodily suffering in a different light from us.

Once on board a hospital ship the comfort and care of the wounded left nothing to be desired. The ships themselves, especially the two belonging to the Red Cross Society afforded all needful comforts and attendance until Japan was reached. Here regularly fitted hospital trains carried patients to the various division hospitals scattered throughout the Empire

and later, if required, conveyed them to convalescent camps.

The desire to free the field units of the care of sick and wounded as rapidly as possible of course commends itself from a purely military point of view but as practiced by the Japanese I am confident that it entailed considerable suffering. For this the absence of suitable field transport is largely responsible, but it should be borne in mind that Japan is almost a horseless country besides being a poor nation and indulgence in expensive means of transportation had to be curtailed.

JAPANESE FAVORED IN MATTER OF CARE OF EVACUATION BY THEIR SUCCESS AND NEVER HAVING FAR TO GO.

Aside from the question of transport, material of the Japanese sanitary service was generally excellent and abundant. I have heard it stated that the soldiers first aid package was of an indifferent quality but in other respects medical supplies were of the best. Great attention was here paid as elsewhere in the packing of material which was in convenient sized chests admitting of transport on pack horses. For all the pitched battles it was the custom of the sanitary units to stock up with an excess of supplies from the Divisional Medical Depot and I never heard of any case of deficiency notwithstand- the huge casualty lists. It was also customary to supplement both personnel and transport by the hire of Chinese carts and coolies in large numbers. In fact, the transport of the wounded to the rear of the main dressing stations may be said to have been largely effected by means of native Chinese, that to the front having been by the men of the litter companies and the company bearers.

As regards the professional ability of the Japanese sanitary personnel I am not qualified to speak. Apparently, however its methods, judged by all that I could see, were in accord with the most modern ideas. Some of the higher sanitary officials were unquestionably able and skillful in their profession having studied in the universities of Europe and able to converse in English, French and German.

Before leaving the subject of organization, it is deemed proper to refer to the aid rendered by the Japanese Red Cross Society which, with a membership of over 1,000,000 and with an annual income of two and one-half million dollars, contributed in no small degree to the success of the Japanese sanitary service. The most noteworthy feature of this Society's aid was its complete subordination to the military service. Instead of attempting to maintain any independent service, it placed its resources in personnel and matériel entirely at the disposal of the War Department, which availed itself thereof in the fullest manner. The personnel of the lines of communication hospitals in Manchuria was largely recruited from the personnel of the Red Cross Society, as was also the personnel of the sanitary service in Japan. Two excellent hospital ships with accommodations for 200 each, owned and operated by the Society, plied regularly throughout the war between Dalny and the home ports.

SANITATION AND HYGIENE

Experience of past wars has shown that losses at the front due to diseases, especially in protracted wars, have exceeded those due to battle. Sanitation and hygiene are therefore of equal importance to the care and treatment of the wounded. Although the Japanese troops were in the field two years, their

general health was maintained at a good standard, but probably not so high as seems to have been generally credited.

Sanitation and hygiene are so intimately related to questions of climate, clothing, food and national characteristics that some observations on these matters are deemed essential.

The climate of Manchuria can be best likened to that of our Western plains region, as presented by the states of Nebraska and the Dakotas. The summers are short and hot, the winters long and cold. Frost is certain for seven months of the year—from October to April, inclusive. My diary shows ice over one-quarter inch thick on still water on the morning of October 8, 1904. Summer temperatures above 100 degrees and winter temperatures 15 degrees below zero are of regular occurrence, while the daily variation is high. The annual precipitation is relatively light and most of it occurs during the months of July and August when most needed by growing crops. The soil is a clayey loam and cuts up badly under traffic, except in winter, when it becomes smooth and hard. High winds are frequent, especially in the spring, and are accompanied by dust storms which are most disagreeable. Under the influence of the wind the ground dries out rapidly—so rapidly, indeed, that transition from a sea of mud to choking dust inside of twenty-four hours is not uncommon. Mosquitoes, strange to say, are rare, and I met them on but two occasions—once on my first landing on the marshy seacoast and later far in the interior towards the Mongolian border near a swampy area. But if mosquitoes are few, Manchuria is not lacking in other forms of insect pests, for it is the paradise of the common housefly, the ubiquitous bedbug, the loathsome body lice, and the lively flea. An English officer described Manchuria by an apt

alliterative phrase as being the land of fleas and flies, bugs and battlefields. So bad was the pest of flies during my march to join the Japanese II. Army in July and August, 1904, that it was literally necessary to fight them off with one hand while conveying food to my mouth, lest I swallow some with each mouthful. The naturally favorable conditions for the propagation of the fly, resulting from the filthy surroundings of the Chinese habitations, were still further favored by the conditions obtaining in the abandoned Russian camps. The native Chinese, although a fine race with many desirable qualities, are not characterized by their observance of sanitary precautions. With them an inch is as good as a mile. Their dwellings, one-storied structures of adobe with thatched roofs, more rarely of brick and tile, swarmed with vermin, while the compounds or court yards, around which were built dwelling house, storehouses and stables, were veritable pig pens in appearance. The village water supply consists of one or more wells, centrally located on the main roads for the convenience of the public, and with no attention to surface drainage or cleanliness of surroundings. Not infrequently the numerous teams halting for water have created a cesspool at the very mouth of the well whose dangerous influence is still farther increased by the near vicinity of the village manure pile, whose seepage contributes to the general filth. In such surroundings the Japanese troops were habitually quartered for their two years of field service.

In the matter of clothing the Japanese soldier was well provided for, thanks to the wise forethought of his government. As the cold weather approached, the service khaki of cotton was laid aside and replaced by the blue woolen winter uniform used in Japan. This was supplemented by a considerable

quantity of special articles, chief of which was a loose brown long-sleeved overcoat with goat fur collar, an armless sheepskin vest, woolen finger gloves, heavy woolen underwear, felt boots for mounted men and straw boots for foot troops, Balaklava caps, etc. This special clothing, while cheap in quality, was entirely serviceable and sufficient for the purpose. In speaking of clothing, it may be mentioned that the Japanese, with their ideas of personal cleanliness, are averse to wearing woolen clothing next to the skin, and usually wore a cotton suit under the woolen underclothing.

Rice was the mainstay of the soldiers' ration, and such is the force of habit and tradition that the soldier was quite satisfied, so long as he could fill his belly with rice. Besides rice, the normal ration comprised an allowance of meat, fresh or tinned, fish, dried or salted, tea, and some of the native sauces, such as soy and miso, which are not inviting to the foreign taste. When transportation requirements permitted, which was not always the case, the ration was varied by the addition of an allowance of sugar, sake and cigarettes. Fresh meat could be secured only sparingly, partly because there is no large supply of cattle in Manchuria, and secondly, because what there was had been preëmpted by the Russians. During the second summer of the war a fair amount of good beef cattle was secured in Mongolia, which supplied General Nogi's army on the left flank to a limited extent. While at Port Arthur General Nogi's army was also supplied on occasions with fresh fish taken from the surrounding waters by the Chinese. Some of the armies, notably, Kuroki's, which operated on the right flank in mountainous country and at some distance from the railroad, was supplied with difficulty over the poor

roads, and at times nothing more than rice could be issued to the men of this army.

The emergency ration, of which three days were carried in the knapsack, consisted in the beginning of the war of tinned meats and boiled dessicated rice. Later on the dessicated rice was largely replaced by biscuit, or, as we would call it—hardtack. Two forms of biscuit were issued, one made of rice flour and the other of wheat flour with an addition of goma seeds, the latter a small, oily seed of agreeable taste. The rice flour biscuit, while palatable, was so hard that it was most difficult to masticate. The flour biscuit was excellent, as I can testify, it having served me largely in place of bread during my field service. The tinned meat was preserved but flavored with soy, which made it so unpalatable that I could not eat it.

In the matter of preparation of food, a rice-eating nation enjoys distinct advantages, for it can dispense with bakeries and ovens. The mess outfit of a Japanese company consists of nothing more than four iron kettles and four sectional sheet iron stoves with a rice washer—the whole carried on a couple of ponies. No special company cooks are required, as any soldier can cook rice. If detached from their company kitchen, the soldiers boil their rice individually in their mess tins. It will be readily understood how simple are the commissary and messing arrangements in a rice-eating army whose food is so little perishable and so easily and simply prepared.

The chief characteristics of the Japanese character, in its relation to sanitation and hygiene, are personal cleanliness and the spirit of obedience which pervades all ranks. Bathing is a national habit, and the commonest coolie is addicted to the daily bath, which is not exactly a bath as we under-

stand it, but rather a good wash, but it answers the same purpose. The deprivation of their baths was one of the real hardships which the Japanese soldiers had to undergo, and his efforts to realize his wants in this particular were both ludicrous and pathetic. Whenever a halt of sufficient duration was made, one was sure to find extemporized bathing facilities, springing into being in the various villages in which the troops were quartered. The hot water supply afforded by the Chinese domestic arrangement of kettle and fireplace would be eked out by the five-gallon kerosene tins of the Standard Oil Company set over open fires in the compounds. A shed or building would be cleaned out, stones dragged in, and soon a bunch of naked soldiers would be seen soaping themselves down and throwing water on each other. Often the huge earthenware jars of the Chinese, used for storing a supply of water convenient to the house, would be made to do duty as a bath tub. These jars are enormous, some four feet high and with a neck eighteen inches in diameter. Often have I seen soldiers squatting down in these jars with only head protruding from the neck, and this, too, at times when freezing weather was holding sway. At all headquarters and halting places on lines of communications bathing facilities, sometimes quite elaborate, were provided. At the headquarters of the 9th Division I saw a rather ingenious contrivance for heating water for bathing purposes which merits reference. It consisted of a small charcoal heater less than one foot cube containing a vertical pipe coil, the ends of which were connected by canvas hose to a huge and deep canvas tub filled with water. A few handsful of charcoal sufficed to heat the entire tub of water in an hour or two to a temperature as high as could be borne by the hand.

The whole apparatus weighs but a few pounds and can be packed up in a very small space.

Where the Japanese soldier gets his habits of obedience I do not know, but he has it to an almost painful extent. With him an order is an order, and the idea of dodging it or evading its spirit is quite impossible. So literally were orders carried out that it not infrequently led to ridiculous situations, and when it came to a test between a man's common sense and obedience to instructions the latter always carried the day. And, mind you, this is not because the Japanese soldier is stupid—on the contrary he is highly intelligent and quick witted.

Having now touched upon some aspects of climatology, food, clothing and national traits, it is time to discuss their effects upon sanitation and hygiene. From what has been said regarding the climate and country, it must be conceded that conditions were far from favorable for the health of the troops. The questionable water supply, the filthy conditions of the Chinese homes which served as billets and the pest of flies and other insects would seem to have made serious epidemics highly probable. That there were none such I think may be attributed in part to the natural personal cleanliness of the Japanese soldier and to his obedient habits, the former trait acting as an antidote to the Chinese filth and the latter leading him to observe the prescribed regulations.

Sanitary regulations being based upon recognized scientific principles are essentially the same in all armies, but it is one thing to prescribe and another to realize compliance. In this particular the natural spirit of obedience of the Japanese soldier was a valuable asset in sanitary results. The boiling of all drinking water and the wearing of abdominal bandages were prescribed and were generally care-

fully observed: While I was an eye witness to some instances of the violation of the rule regarding the drinking of unboiled water, these occurred on the march or in battle under exceptional circumstances. Perhaps we are attributing too much virtue to the Japanese soldier in his observance of the rule not to drink unboiled water, for he will not drink water if he can get tea, which was always the case in camp. Incidentally, ration tea was issued in the shape of small compressed plugs, much resembling plugs of tobacco, from which the soldier shaved or whittled the requisite amount as required.

During the first summer of war the troops were more or less constantly on the move and changed their billets quite frequently, which fact, no doubt, contributed materially to the general health. With the exception of beri-beri only, the general health was excellent and I was informed by the Chief Surgeon of the II Army that the percentage of admissions to hospitals was practically the same in the field as it had been in garrison and that the physical condition of the men was if anything better, most of them having taken on weight. The excellent health, during the first summer of the war, except in the matter of beri-beri, is all the more remarkable to my mind for there appeared to be many violations of evident sanitary precautions. Thus, field sinks were frequently not dug at all or only after some days and after the surrounding ground had been pretty well contaminated with excreta. No attempts were made to guard against dangers from flies and the filth and dirt of the Chinese quarters were accepted as found.

But if the general health of the troops was excellent, in other respects beri-beri levied a heavy toll of victims. It was the bugbear of the sanitary service during the warm season, more especially during the first year of the war, when it made tremen-

dous inroads on the effectiveness of the fighting troops. General Nogi's army before Port Arthur was a particular sufferer from the disease.

Once a man is hit with beri-beri he is useless at the front, and if retained here, the chances of his recovery are diminished, as well as taking much longer. All patients were therefore shipped back to Japan as expeditiously as possible, there to be distributed to the various Division Hospitals and to their homes, where the larger part made speedy recoveries and were returned to the front. An American employed as captain of a Japanese transport told me that during July and August, 1904, beri-beri patients were being shipped to Japan at the rate of 1,000 a day. No doubt this is an exaggeration, but none the less, the ravages of the disease was a matter of grave concern to the Japanese. It was a warm weather disease only and practically disappeared with the advent of cold weather.

The cause of beri-beri is laid at the door of the excessively farinacious character of the Japanese ration, mainly rice. It was further thought that the method of preparing the rice was responsible for the increased activity of the disease during the warm months of the year. During the first summer of the war it was customary to cook the rice for morning and noon of the next day and issue it to the soldier, who carried it on his back in his aluminum mess tin. The hot sun beating down on this caused incipient fermentation to set in so speedily that by noon the soldier's rice had soured.

During the second summer of the war the rice ration had added to it 20 to 25% of barley and a change was made in the hours of cooking. Whether these precautions are responsible or not, or whether the fact that there was practically no campaigning after the battle of Mukden, beri-beri fell off most

[redacted] during the second summer of the war. But while [redacted] was less prevalent there was a consequential increase of other diseases, typhus, intestinal [redacted] dysentery, due it was thought to the [redacted] crowded billets for a long period of [redacted] of typhus and dysentery [redacted] during July and [redacted] cause some alarm and [redacted] discussion raised in the camp [redacted] Nogi's army by some alarmist [redacted] out. As a matter of fact [redacted] been almost 10% of the command [redacted] divisions nearest the Liaho River which [redacted] down with typhoid or dysentery. Of those stricken fully 25% succumbed.

During the second summer of the war the observance of sanitary precautions was much more thorough and general than during the first summer. Latrines were dug everywhere and covered daily with fresh earth or lime, the latter hard to secure; the Chinese themselves were made to clean up their compounds and to drain them, while both natives and troops were used to ditch the [redacted] occupied towns and villages, drain or fill in [redacted] and to otherwise remove all other unsanitary features [redacted] near the soldier's billets. During this [redacted] called crematorie pits were issued to all [redacted] aks taken after meals. I am told that [redacted] ays the daily" an injunction [redacted] y wines [redacted] mas- [redacted] h an- [redacted] ounde- [redacted] as ex- [redacted] heavy [redacted] nitary [redacted] lly dur- [redacted] cremen-

Aside from [redacted] was always [redacted] fore the [redacted] practicable [redacted]

be brought into use in time. If the water was unsafe it was marked as "horse" water and the troops were not supposed to use it. Personally I do not think that such investigations as the regimental surgeons could make, when they could make them at all, amounted to very much. The real fact was that in ordinary marches the soldiers did little drinking of casual water but relied upon their canteens filled with weak tea, made the evening before. When halted, water could always be boiled and was always done.

During the second summer of the war a considerable number of water boilers, mounted on the little two wheeled carts made their appearance. These were intended to boil and carry water on the march. As there was no marching to speak of after the battle of Mukden they came too late to be of much service. Their idea was undoubtedly taken from the Russian traveling kitchens, large numbers of which were captured and some used by the Japanese for boiling water.

During the severe winter of 1904—05, especially during the battle of Heikoutei or Sandepu there were quite a number of frost bites, more particularly amongst the wounded who could not be reached with sufficient promptness. I am told that quite a number of amputations were necessitated in consequence.

In contrast with the frost bites, the intense heat of the summer induced not a few cases of sunstroke in 1904 when the troops were toiling and fighting in a temperature of 100° F.

Of foot soreness there was relatively little, not owing to any particular virtue of the Japanese shoe but because there was not so much marching done during the war. Moreover, when the Japanese soldier gets foot-sore he has a solution of his trouble quite unique. He hangs his shoes to his pack and

puts on a pair of Japanese sandals, which most Japanese can make out of rice straw.

The severest marching test was that imposed on General Nogi's army after the capture of Port Arthur and when it was moved to Liaoyang in January 1905. To harden the infantry who had had no experience in marching while in the seige trenches, they were marched to Liaoyang a distance of 200 miles. The bitter cold weather put a quietus on the native sandal game and as a result a large number of cases of sore feet.

Another question more or less related to that of sanitation and hygeine is the one of cleaning the field of battle after an engagement. The Japanese regulations prescribe cremation for the disposal of their dead, but owing to the scarcity of fuel in Manchuria and likewise to the large number of corpses, this regulation could not be carried out generally. In fact, by far the largest number of dead were buried in pits specially dug for the purpose or disposed of by dumping them into some convenient fire trench and covering them over. The bodies of officers were, however, uniformly cremated. In the disposition of their dead, the Japanese displayed a want of concern that is shocking to an Occidental. One would almost think them without feeling or reverence but for the evidence of simple but impressive memorial services which invariably follow the battles and for the many crude and original monuments erected on the field of battle to the memory of fallen comrades.

In the eyes of the Japanese there can be no higher honor than to be buried on the field of battle where they died for their beloved country. Before interment or cremation the soldier's identification tag and a bit of hair are taken from the body and enclosed in an envelope. The number on the identi-

fication tag is sufficient to establish the identity of the man, and the bit of hair is sent to his nearest relative and serves as the basis for the funeral rites at his home.

A few statistics showing relations between battle casualties and diseases may be of interest. As an average case, that of the V. Divison will serve. This division had 12,088 battle casualties all told during the war, of which 2,544 were killed, 9,458 wounded, and 86 missing. This shows a ratio of about one killed to four wounded and a total battle casualty of 86 per cent of the combat strength. The total cases of admission to field hospitals for causes other than battle numbered 9,175 with 867 deaths, classified in part as follows:

Typhus	1,367 cases	499 deaths
Dysentery	245 cases	71 deaths
Beri-beri	2,452 cases	141 deaths
Frost bites	691 cases	
Sun stroke	84 cases	
Sore feet	408	

Attention is invited to the relation of battle casualties, 12,088, to the disease casualties, 9,175.

In the 1st Divison for the months of August, September and October, 1904, there were 4,292 battle casualties, as compared with 2,782 disease casualties, the latter divided as follows:

Beri-beri	1,504
Dysentery	200
Typhoid	144
Intestinal troubles	412
Others	522

In the III. Army, as a whole, the last seven months of 1904 and the first seven months of 1905 showed a total of 42,853 admissions to hospitals for sickness only. The III. Army consisted
divisions until November, 1904, when i

enforced by the 7th Division, and had a total ration strength of about 100,000. The foregoing cases of sickness were distributed as follows:

Beri-beri	11,988
Dysentery	1,058
Typhoid	340
Non-epidemic	29,467
	42,853

During this period the battle casualty of the III. Army was 76,586, being about 100 per cent of its combat strength. The 9th Division, which was probably the hardest hit division in the entire army, had a battle casualty of 22,938 during the war, or 164 per cent of its normal combat strength.

From the foregoing we may infer that the losses from disease averaged something like 60 to 80 per cent of the losses due to battle. In instituting this comparison, it must be borne in mind that the battle casualties of the Japanese were unusually heavy, which tends to lend a more favorable showing to the casualties from disease.

To sum up, my impressions regarding the Japanese sanitary service during the Manchurian campaign are as follows:

1. That the service as a whole was excellent and that this was due to a large personnel, thorough preparation and complete organization—in other words, a perfected system in which chance did not enter.

2. That in the matter of disease, the Japanese were, after all, not so remarkably fortunate as popularly supposed. While the percentage of dysentery and typhoid was fairly low, they had plenty of trouble with beri-beri.

3. That the Japanese sanitary service was defective mainly in adequate and

appropriate means for the transport of the wounded.

What we have to learn from them mainly is the lesson of preparation and organization. Of personnel and matériel there is no lack of abundance in this great and rich nation.